his issue: Die Casting Dies—Machining Angles—Deburring Castings

The Magazine of

NOVEMBER, 1951

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

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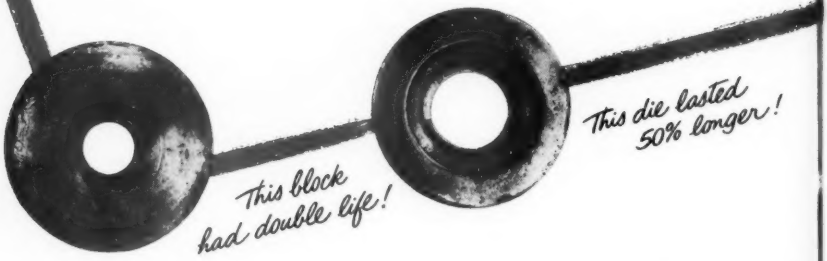
. . . anywhere from 1½ to 5 times the Performance



This block had double life!

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Looking for a better hot work steel? You'll find it in B-47—an improved chromium, tungsten, cobalt, vanadium type. Developed originally for applications in the copper and brass industry, B-47 has given excellent results on difficult hot work jobs on steel.

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22" Diameter Table Top

4, 6, 9, 12, 18 or 36 positions

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Positions up to 1000 lbs. quickly and accurately

★

Positive locking

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Can be mounted in any position

Bellows Model BRET-22 Rotary Feed Table is an electrically controlled, air-powered unit for dial feeding work pieces to drilling machines, tappers, reamers, press rams, etc.

Powered by a 3⅛" bore Bellows Air Motor, the standard 22" diameter table top will position loads of 1000 lbs., quickly and accurately.

At each station the table top comes to a stop gently, without abrupt impact, and is locked into position by a 1¼" bore air cylinder. Model BRET-22 is easily synchronized electrically to other machine operations.

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Write for Bulletin T-85 Today! Address: The Bellows Co., Dept. TDJ 1151, Akron 9, Ohio

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The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road • CLEVELAND 18, OHIO
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Hammond Machinery Builders INC.

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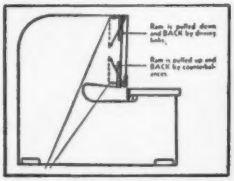
Keep up to date on Shearing!

Learn about... the exclusive features illustrated below—and many others.



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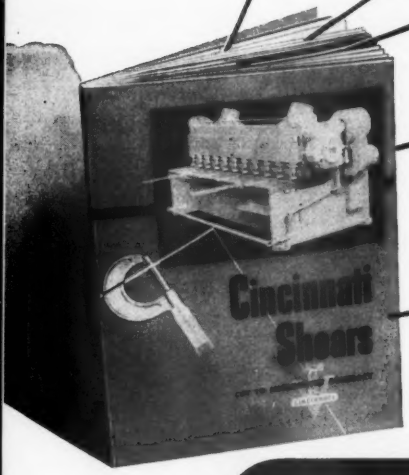

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Just off the press This up-to-the-minute, illustrated catalog will give you a complete description of the speedy, accurate All-Steel Cincinnati Shears in capacities from 12 gauge to 1¼-inch steel plate, in 4-foot to 24-foot lengths. Also, many special features for particular needs are illustrated and described.

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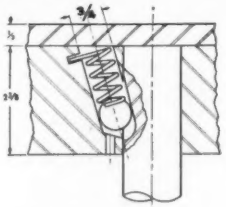
with New R-B Extra Heavy Duty Retainer
– Heavy Piercing Problems



Here's a new combination of an extra heavy duty retainer and new punch design that brings economies of R-B interchangeability to hole-making formerly done by drills or without interchangeable punches.

For instance, in the application shown above, this heavy duty design enabled interchangeable punches to pierce ⅝" thick SAE 10-45 steel and eliminated costly drilling. The ball lock gives positive alignment and sure stripping without the use of other keying devices.

If you have thought your piercing jobs too tough for interchangeable punches, then it will pay you . . . in design, construction and operation savings . . . to investigate this new R-B extra heavy duty retainer. **Allied Products Corporation, Richard Brothers Division.**

CHECK THESE OTHER R-B FEATURES, TOO!

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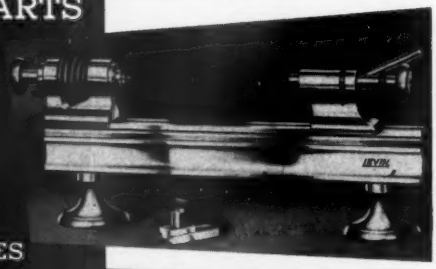
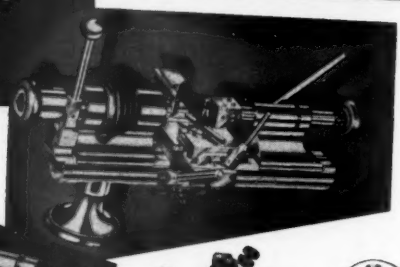
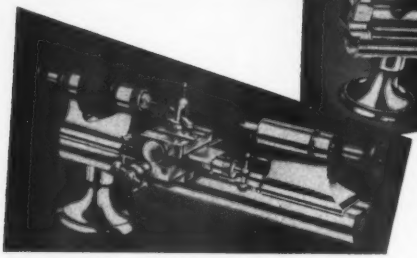
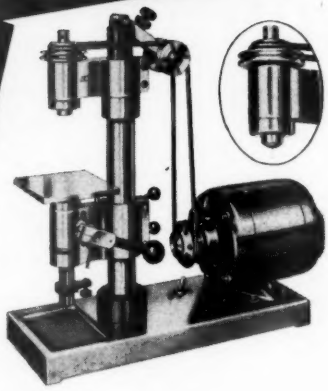








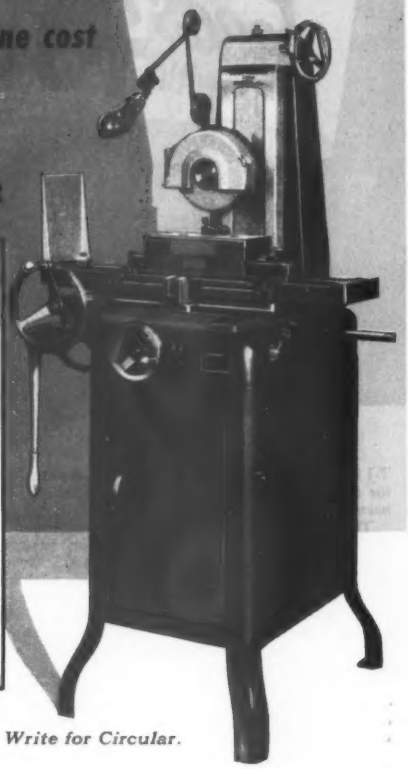
An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

LOUIS LEVIN & SON, INC.
782 E. Pico Blvd., Los Angeles 21

big machine performance

at small machine cost

BOYAR-SCHULTZ
No. 6-12 SURFACE GRINDER



A PRECISION Surface Grinder with the type of accuracy that has always been associated with larger and more costly machines.

It is speedy and proper location of controls makes it unusually convenient to operate.

Users of the Boyar-Schultz No. 6-12 Surface Grinder tell us they obtain flatness, vertical and parallel tolerances that compare with the best work of any other surface grinder, regardless of size.

It is the kind of machine that is turned to instinctively for intricate gage work.

BOYAR-SCHULTZ NO. 6-18 TOOL ROOM SURFACE GRINDER

Write for Circular.

BOYAR-SCHULTZ CORPORATION
2112 Walnut Street, Chicago 12, Illinois

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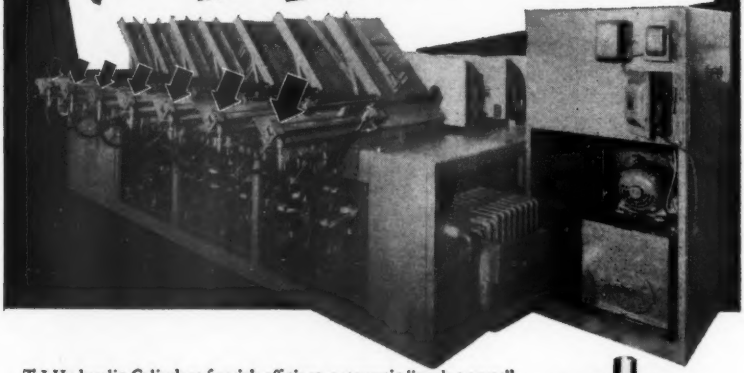
Job File No. 3259

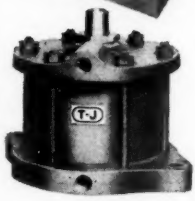
Feeds Automatically with T-J CYLINDERS

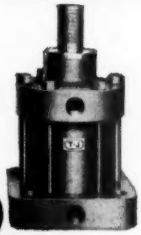


T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations . . . each with *hydraulically operated billet feeding devices employing T-J Cylinders.* These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor* and *cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles . . . cushioned or non-cushioned . . . 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.





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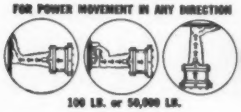

100 LB. or 50,000 LB.

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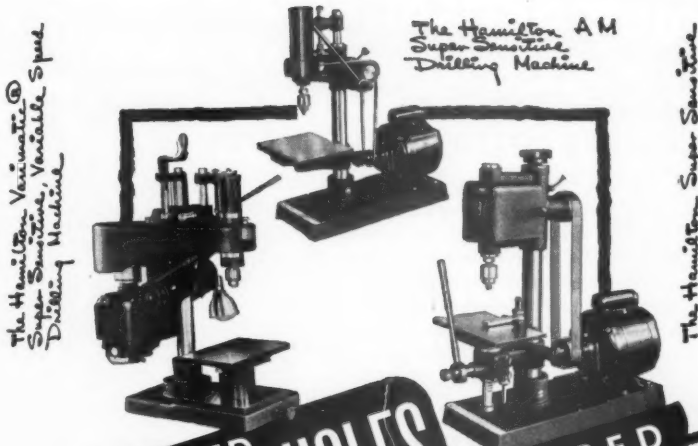
The Hamilton Varimatic® Super-Sensitive, Variable Speed Drilling Machine
The Hamilton A-M Super-Sensitive Drilling Machine
The Hamilton Super-Sensitive Tapping Machine

DRILLED HOLES TAPPED

Hamilton DRILLS AND TAPPERS

MAKE TIME • SAVE COSTS
ON ACCURATE SMALL HOLE PRODUCTION

Small holes . . . *tiny holes* . . . in materials of such diverse characteristics as fiber and monel, ceramic and bronze, are being drilled and threaded speedily, accurately, *profitably* . . . NOW . . . by thousands of Hamilton Drills and Tappers.

The Hamilton VARIMATIC® DRILL,
The Hamilton A-M DRILL,
The Hamilton TAPPER,

each a bench type, super-sensitive machine with ample clearances and travel, incorporate such precision that work is always held well within the tolerance allowed, and such stamina that they maintain their accuracy year after year even under heavy production loads. Our *free* Bulletin No. V-472 provides full information including specifications. Write now! Tomorrow you may need the information.

THE *Hamilton* TOOL COMPANY
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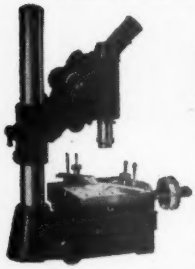
Save time and money—*more accurate measurements than with any other projector!* Angular measurements to ±1 minute of arc, with protractor screen. Direct linear measurements to ±.0001" over 4" x 6" range, with cross slide stage. Spot inaccuracies quickly and simply. Compare production-run parts directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. *Catalog* D-27.



2 TOOLMAKERS' MICROSCOPE

Linear measurements to ±.0001"; angular measurements to ±1 minute of arc, with protractor eyepiece. Simple, quick measurement of opaque and transparent objects of any contour. *Catalog* D-22.

3 STEREOSCOPIC WIDE FIELD MICROSCOPES

Sharp, three-dimensional, unreversed images. Speed and accuracy in small parts assembly operations, inspection of tools and finished parts, and precision machining of small parts. 15 models, widely used in industry. *Catalog* D-15.

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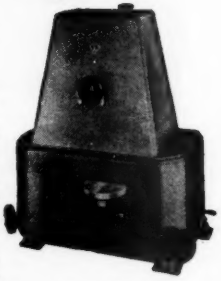

Now you can have "laboratory" accuracy of 0.000001" in the determination of flatness and parallelism of reflecting surfaces... with production-line *simplicity* and *speed.* So simple that an unskilled operator can take measurements after a few minutes of instruction. Two sizes available. *Bulletin* D-224.

WRITE for full information on these four important optical aids, to help you save time and money. You may be paying many times over their cost in lost time and rejects. Bausch & Lomb Optical Co., 798-11 St. Paul Street, Rochester 2, N. Y.

B&L Bausch & Lomb *Quality Control* Instruments

Cut Costs with

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AIR PRESS

PNEUMATIC WORK FEEDERS

AIR CYLINDERS

AIR VISES

SINGLE ACTING AIR CYLINDERS

MIDGET AIR CLAMPS*

Besides the standard, ready-made fixtures for the application of Air Power (such as the Air Press, Air Vise, Air Chuck, Air Clamp), Mead offers a wide selection of air cylinders, which can be used in special jigs and fixtures. Illustrations show four types of double-acting cylinders, which can be furnished in five different bores with optional length of stroke.

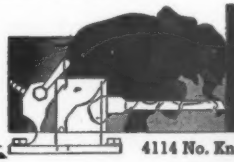
Use Mead Air Power

Get faster, more economical production set-ups—investigate the entire "family" of Mead Air-Operated devices. Hundreds of progressive factories now use them to do better, faster, more economical jobs. Do you want to move things—lift them, slide them, tilt them—or hold them firmly? Mead Air Power will do it. Do you need a delicate, flexible touch—or tremendous pressure? Mead Air Power has them both. If you are interested in saving time, money and man-power now and for the future, investigate Mead Air-Operated devices now.

**PNEUMATIC CYLINDERS*

• **Catalog Ready**

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.



MEAD SPECIALTIES COMPANY

4114 No. Knox Ave., Dept. HA-111, Chicago 41, Ill.

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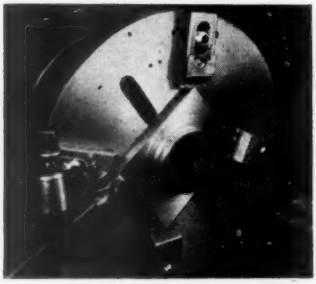
PRODUCTION RATES CLIMB
WITH
NEW J & S JAW CLAMPS

J & S
"All-Purpose"
JAW CLAMPS

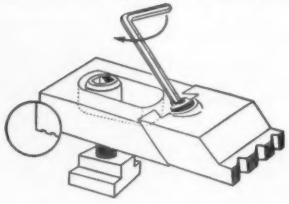
ELIMINATE U-Clamps, Straps & Fingers—also, in most cases, eliminate 4-jaw chuck, vises and special fixtures! For lathes, planers, milling machines & drill presses.



For Face Plate or Machine Table

Typical lathe application. Work-piece removed by simply loosening one screw in each of two adjoining clamps. NO REPOSITIONING NECESSARY for next piece.

Fastest, simplest—work-pieces held rigidly. Less obstruction, no slipping, because a 1/16" **tapered slot insures firm grip.** Also, angle of jaw travel is 45° to plane of the face plate or table. As the screw is tightened, the jaw forces the work-piece down against the machine surface—**across** against the opposite clamp—this grip is **stronger than that** provided by **eight** U-clamps!



Tested for two-ton down pressure, completely hardened.

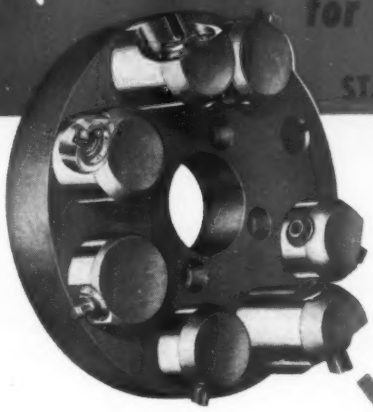
As the drawing shows, jaws of the standard J & S Clamp are only 23/64" thick — allows overall machining to within 3/8" of the machine's working surface! Available in types and sizes to suit all applications. "T" nuts furnished to fit all standard machines.

J&S TOOL CO., INC.
475 Main Street, East Orange, N. J.
Representatives — Principal Cities

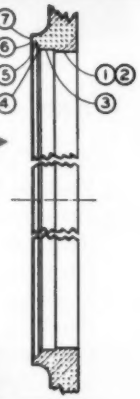
WRITE FOR NEW FOLDER!
—Contains complete details on advantages, applications, types and sizes available. "Time Saver" booklets, describing J & S "Fluidmotion" Wheel Dressers, etc., also on request.

MICROBORE
by DeVLIEG

Special BORING BARS
for PRECISION WORK
Equipped with
STANDARD MICROBORE TOOLS



Special bar used in boring, counterboring and chamfering (in one operation), a cover for a jet engine combustion chamber.

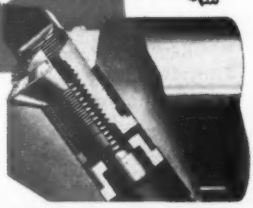


OPERATIONS

1. Rough Bore 10.855 Dia.
2. Finish Bore 10.8755 Dia.
3. Bore 11.000 Dia.
4. Form 30° Chamfer
5. Bore 11.252 Dia.
6. Form 45° Chamfer
7. Face Boss

There is a Microbore representative in your area who will be pleased to call on you for further consultation.

BORING •
TURNING •
FACING ■



ILLUSTRATED CATALOG MAILED ON REQUEST

Each tool independently adjusted by proven micrometer, vernier principle.

DeVLIEG MICROBORE COMPANY

460 FAIR AVENUE • FERNDALE 20, MICHIGAN, U. S. A.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Hi-Speed rotary filing of metal pattern

When Patterns are Finished the Haskins Way

When you file and finish metal patterns with Haskins Flexible shaft equipment, you get the precision craftsmanship that assures quality production. Designed to speed pattern, die and mold finishing, Haskins HS-4 equipment—½ h.p.—has a six-speed, Timken-bearing countershaft that develops up to 7800 r.p.m. Available with bench, pedestal or overhead mounting. The Haskins complete line of machines and attachments gives you the right combination for all grinding, sanding, filing, or polishing operations. Write today for complete information. R. G. Haskins Co., 605 S. Washtenaw Avenue, Chicago 12, Ill.

Overhead Suspension

Bench Mounted...

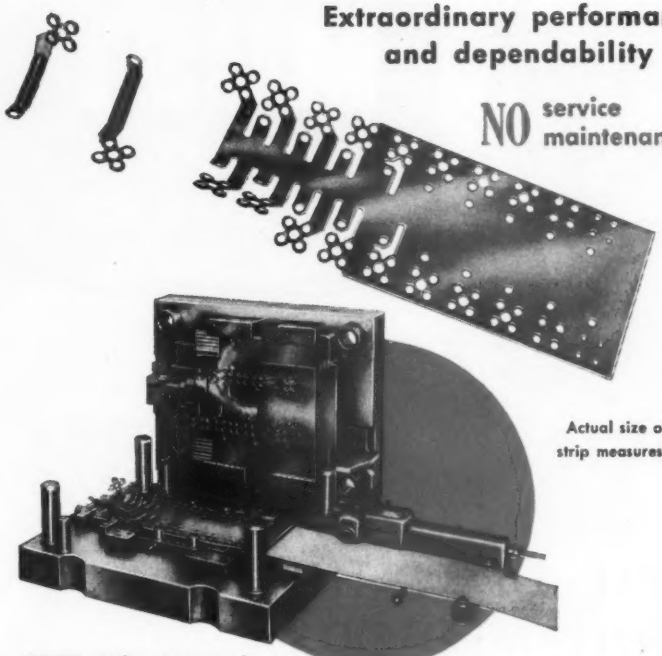
Pedestal Mounted...

haskins
FLEXIBLE SHAFT EQUIPMENT

HASKINS

Extraordinary performance and dependability

NO service maintenance



Actual size of work strip measures 21¼".

ELEVEN station progressive die for production of right and left hand ignition cable supports. Photograph illustrates Rol-Di-Feed mounted directly on die set, feeding .073" thick x 7⅞" wide c.r.s. In operation over two years —customer reports no service or maintenance expense!

WRITE TODAY FOR COMPLETE DETAILS

ANOTHER fine example of the outstanding performance characteristics you can expect from Dickerman 9 inch Rol-Di-Feed.

DICKERMAN 9 INCH ROL-DI-FEED

MAJOR manufacturers of appliances, time pieces, sun glasses and cameras, motor laminations, lighting fixtures, locks and prominent stamping companies now use the Rol-Di-Feed.

Investigate the advantages of automatic feeding with Dickerman Rol-Di-Feed.

H. E. DICKERMAN MFG. CO.

DEPT. K, 323 ALBANY STREET SPRINGFIELD, MASS.

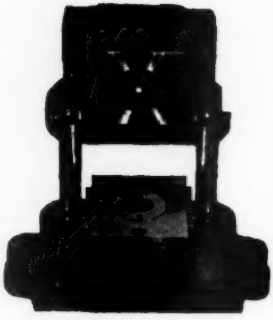
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

A "MUST wherever WASHERS are made!"

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



Made in 5 sizes:
¼"—1½"—2½"—4"—6".

Write for literature.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Phone: Slocum 7-1334

VAN DYKE, MICHIGAN
Suburb of Detroit

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Doing a bigger job . . . better

The advantages of V 20 bond wheels are best realized on production jobs where they provide extra efficiency and economy in fast, accurate tool grinding. Stock removal rate is high at reduced wheel pressures. With a minimum of heat generation and excellent form holding qualities—long lasting V 20 bond wheels impart a uniform fine finish that extends tool life between grinds. The effective use of fewer grades, (smaller inventories) to do a variety of jobs is another advantage often realized.

Only CARBORUNDUM
TRADE MARK

makes ALL Abrasive Products . . . to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Underwood gets over 975,000 extra hinges from Carboloy die

METAL BLANK (top) is pressure-fed into die made from Carboloy cemented carbide slotted bushing (middle). Formed hinge is then ejected sideways from die (bottom).

Switch-over to die of long-wearing Carboloy cemented carbide increases die life 4000%, virtually eliminates maintenance costs . . . illustrates savings you can get in your plant, too.

After forming only 25,000 hinge loops, hard-steel dies at Underwood Corporation had to be completely rebuilt. A die of Carboloy cemented carbide was substituted. It formed over a million pieces . . . required absolutely no maintenance, showed no detectable sign of wear.

More, Carboloy cemented carbides have replaced hard-steel on a multitude of noncutting operations at Underwood. Throughout its Bridgeport Plant, carbide forming, swaging and punching dies have outworn steel dies from 40 to 100 times; have eliminated costly downtime and maintenance on several jobs.

WEARPROOFING BENEFITS

With Carboloy dies, users everywhere report longer die life, better product finishes, closer tolerances, fewer rejects . . . all the wearproofing benefits that mean more production at a savings in time, money and manpower.

Get these savings yourself. If you have high-cost, time-wasting blanking, forming, punching or drawing operations, consult the Carboloy organization. We are headquarters for the finest in high-quality cemented carbides . . . first in carbide die design and application services, outlined at right. Write for free data.

Get all the extras, too . . . FREE!

Carboloy services are designed to help you conserve your dies . . . give you new highs in production at a minimum of maintenance, maximum of savings.

DIE ENGINEERING MANUAL, D-124: Vital facts to assist you in proper application techniques of cemented carbides to dies and punches for more efficient sheet-metal drawing, forming, blanking, etc. Write for free copy.

DIE TRAINING SCHOOL: Practical courses to teach your die-room personnel how to get the extra from carbide dies. Includes specialized courses in finishing and servicing dies. Write for specific information.

DIE ENGINEERING SERVICE: Skilled, job-experienced Carboloy Field Engineers are ready at all times to assist you with your die problems. Contact your local Carboloy Field Engineer or write for this free service.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11111 E. 8 Mile Road, Detroit 32, Michigan

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

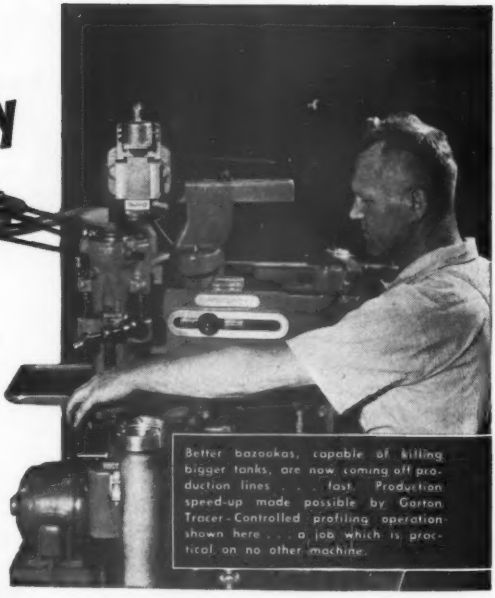
Specify **CARBOLOY®**
CEMENTED CARBIDE

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Pantography at Work

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

• IMPROVES QUALITY • INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka

MATERIAL: Aluminum alloy

CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually

HOLDING FIXTURE: Pneumatic-operated internal expanding type

APPROX. TIME: 36 pieces per hour

ALTERNATE METHODS: None practical

GEORGE GORTON MACHINE CO.

1211 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1211.

Firm .....

Name .....

Title .....

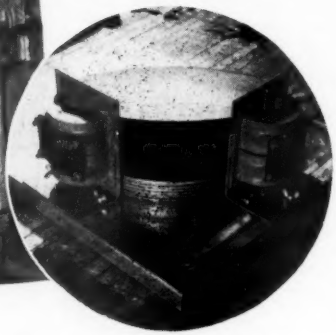
Address .....

City, State .....

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Speed up feeding

presses . . . press brakes . . . shears



with the

TRADE Verson MARK

SHEET FLOATER

Float that steel . . . and save time, money and manpower. The Verson Sheet Floater makes it possible to separate stacked steel sheets or blanks without difficulty—speedily and with minimum damage to gloves and minimum danger of cuts and lacerations to worker's hands. Completely self-contained, requiring no electric or air connections, the Verson Sheet Floater consists of powerful Alnico V magnets arranged to induce a magnetic field in the stacked sheets in such a manner that the sheet ends repel each other and fan out with air space between them.

You can put Sheet Floaters to work in your plant for a very modest investment. Write today for descriptive literature and prices.

See the Sheet Floater on Display at Booth 47, ICHAM Exposition.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9335 South Kenwood Avenue, Chicago 19, Illinois So. Lamar at Ledbetter Dr., Dallas 15, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

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Solve Your Special Machining Jobs

WITH THE NEW Delta Air POWERED Hydraulic DRILL UNIT

Controlled power for automatic drilling, reaming, centering, chamfering, spot facing and hollow milling – and many other operations – FROM ANY POSITION!

Check these important exclusive advantages:

- Infinitely Variable, Quickly Adjustable Hydraulic Feed—no recamming or changing lead screws to change feed.
- Quick, Accurate, Positive Control of Rapid Traverse —no over-travel; reduces tool breakage. Approach consistently at 5 to 6 inches per second to within .010 inch of work.
- Quick, Accurate, Positive Depth Control — no over-travel; will repeat depth consistently to within .0005 inch.
- Automatic Cycling—Built-in cycle control switches provide for full electrical remote control. Eliminates installing external switches.

Two sizes—capacities up to 5/16-inch diameter drill and 1/2-inch diameter drill respectively.

There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 MACHINES — 246 MODELS — MORE THAN 1300 ACCESSORIES

For Delta Dealers, see your Classified Phone Directory under "Tools."

Use this new Drill Unit Catalog to help you select the size best suited to your needs. Contains complete specifications, and on-the-job photographs of Air Powered Hydraulic Delta Drill Units in leading plants. No charge—use the coupon.

DELTA POWER TOOL DIVISION

Rockwell

MANUFACTURING COMPANY

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Please send me new Drill Unit Catalog

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Company_____

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HARDINGE-SJOGREN SPEED

HARDINGE ELMIRA, N.Y.

Collet Chucks with HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge Steel Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both short and long lengths properly.

. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

Write for Bulletin 8— complete information on

HARDINGE-SJOGREN Chucks and Collets.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

How to stretch a ton of steel

A typical cross-section assortment of file-steel stock. Sixteen such bundles weigh approximately a ton.

WITH the national emergency cutting allotments for civilian uses, conserving steel is the duty of every manufacturer and user of industrial tools. Take vitally needed files. Steel is the only material from which they can be made. It must be "stretched":

1. ***By putting the utmost wear into every file*** . . . for it takes no more steel to produce carefully shaped, accurately cut, properly hardened files than to turn out poorly made, short-lived ones. That's "stretching" steel in the *making* of files . . . in which Nicholson is doing its part wholeheartedly.

2. ***By proper selection, use and care of files.*** That's "stretching" steel in the *using* of files. In all of these directions, the industrial distributor can help you the industrial user. You, in turn, can add to the "stretch" by enforcing the "Do's" and "Don'ts" of file conservation among your production heads, toolkeepers and mechanics.

"File Filosophy," Nicholson's interesting 48-page handbook, has many hints on use and care of files. FREE — how many copies do you need? Write direct to us.

NICHOLSON FILE CO.
95 Acorn St.
Providence 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON
...A FILE FOR EVERY PURPOSE

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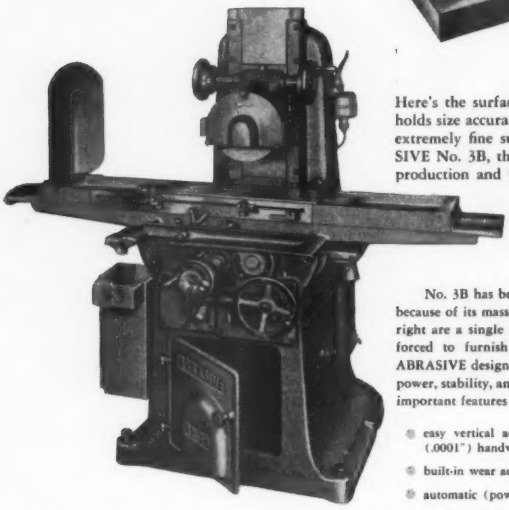
A GREAT GRINDER FOR FINISH



Here's the surface grinder that's fast — that holds size accurately — that produces work of extremely fine surface finish. It's the ABRASIVE No. 3B, the right grinder for countless production and tool room jobs.

No. 3B has been selected by leading industries because of its massive construction; the bed and upright are a single casting, heavily ribbed and reinforced to furnish utmost rigidity. This original ABRASIVE design-feature accounts, in part, for the power, stability, and endurance of the No. 3B. Other important features are:

- easy vertical adjustment of head with graduated (.0001") handwheel
- built-in wear adjustments
- automatic (power) longitudinal and cross feeds
- box-type saddle
- hydraulic table shock absorbers
- big capacity: 24" long x 8" wide x 12" high
- 3 H.P. motor (5 or 7½ H.P. for special work)
- super-precision, cartridge-type spindle
- one-shot lubrication system

It will pay you to get detailed facts and figures about Abrasive No. 3B and No. M3 Surface Grinders. Send for catalog. ABRASIVE MACHINE TOOL CO., 16 Dunellen Road, East Providence 14, Rhode Island. Distributors throughout the world.

No. M3 Motorized Spindle Surface Grinder

This grinder has all the features of the No. 3B, plus the motorized spindle. No. M3 is widely used in the production of interchangeable parts . . . in the toolroom and on the production line.

Abrasive Quality is Reflected in the Finish of Your Product

ABRASIVE
ACCURACY BOOSTS PRODUCTION

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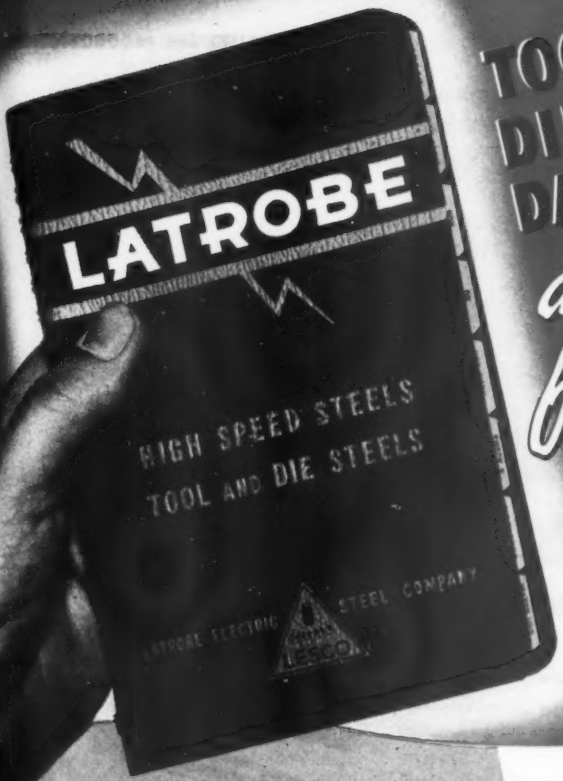


TOOL AND DIE STEEL DATA... *at your fingertips*

- ★ ANALYSES AND PROPERTIES
- ★ RECOMMENDED HEAT TREATING
- ★ FORMS IN WHICH FURNISHED
- ★ TYPICAL APPLICATIONS

PUBLISHED AS ANOTHER LATROBE SERVICE TO TOOL AND DIE STEEL USERS . . . SHOPMEN, TOOL AND DIE MAKERS, FOREMEN, ENGINEERS . . . THIS HANDY, POCKET-SIZE REFERENCE BOOK GIVES YOU UP-TO-THE-MINUTE INFORMATION ON EACH OF THIRTY-FIVE OF THE MOST WIDELY KNOWN AND USED TYPES OF TOOL AND DIE STEELS PRODUCED BY LATROBE ELECTRIC STEEL COMPANY.

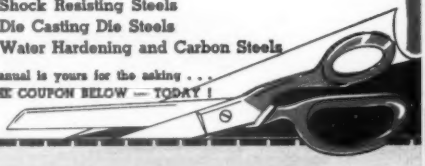
Eighty-six pages, 4" x 7", bound in a flexible cover, this manual is designed to fit your pocket. Reverse sides of index tabs show tables and data of practical value in everyday practice:

- ★ **Decimal equivalents of one inch**
- ★ **Hardness, temperature and millimeter conversion tables**
- ★ **Weights, by size, of hot rolled round bars, drill rod, flat and square bars.**

Handy index tabs for easy selection of:

- ★ **High Speed Steels**
- ★ **Non-deforming Die Steels**
- ★ **Oil Hardening Die Steels**
- ★ **Hot Work Steels**
- ★ **Shock Resisting Steels**
- ★ **Die Casting Die Steels**
- ★ **Water Hardening and Carbon Steels**

This manual is yours for the asking . . .
USE THE COUPON BELOW — TODAY !



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LATROBE, PENNSYLVANIA

SOLE PRODUCERS OF DESEGATIZED BRAND STEELS

Mill Offices & Warehouses: BOSTON, BUFFALO, CHICAGO, CLEVELAND, DAYTON, DETROIT, HARTFORD, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, PITTSBURGH, SEATTLE, TOLEDO

Sales Agents: BIRMINGHAM, DALLAS, DENVER, HOUSTON, ST. LOUIS, WICHITA

LATROBE ELECTRIC STEEL COMPANY, Latrobe, Pa.

Gentlemen: Please send me, at once, your tool and die steel manual at no obligation. **"TP3"**

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TITLE .....

COMPANY .....

STREET .....

CITY ..... ZONE..... STATE.....

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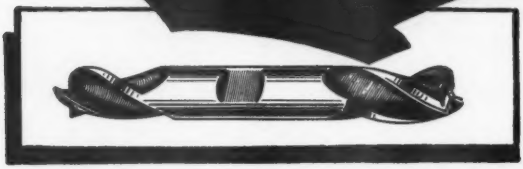
END MILLS . . .

Including THE POPULAR 3 FLUTE!



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Arrow's "FASCUT" line of End Mills is complete and it is dependable. Backed by 35 years of manufacturing skill and engineering experience, "FASCUT" End Mills assures users high production efficiency.

OVER A THIRD OF A CENTURY OF CUTTING TOOL EXPERIENCE

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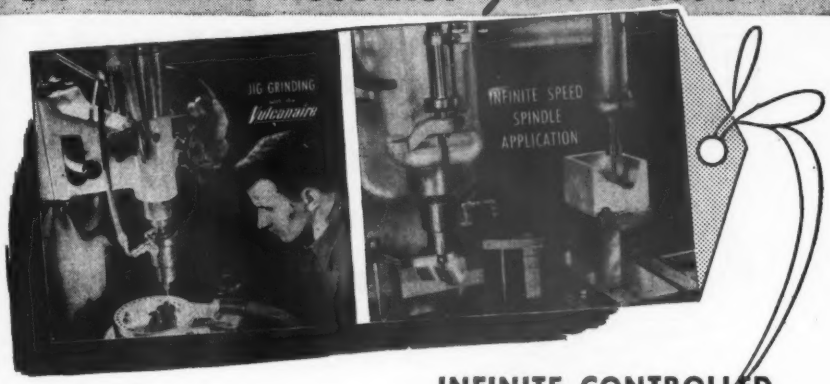
JIG GRINDING ACCURACY *guaranteed**



INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

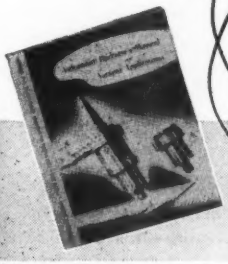
Then you can finish grind in hardened steel to "tenths"., jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

*Dependably accurate to "tenths"

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅝" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.



For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

Vulcanaire

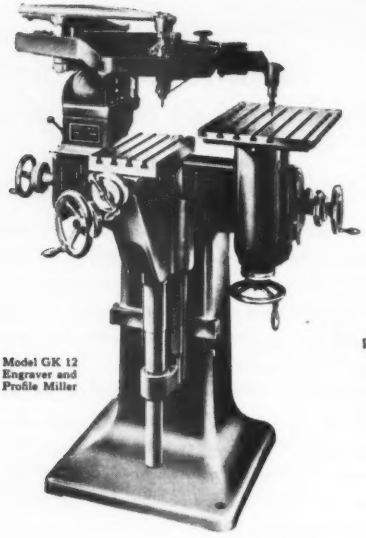
BUILT BY TOOLMAKERS FOR TOOLMAKERS

VULCAN TOOL CO., • PRITZ STREET • DAYTON 10, OHIO

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

DECKEL ENGRAVERS and PROFILE MILLERS

for
- Extreme Accuracy
- High Surface Finish
- Economical Production



Model GK 12 Engraver and Profile Miller

Whether you are engraving small watch cases or profiling dies or molds up to 550 pounds, you can accomplish it with greater precision and speed on the Deckel GK 12 or GK 21 Three Dimensional Pantograph Engraver and Profile Miller.

The sensitive pantograph and adjustable cutter spindle – guided by finger-tip control – assures extreme accuracy in reproduction and excellent surface finish: Reducing or enlarging ratios range from 1:1.5 to 1:10.

These machines are equipped with forming attachments and can be furnished with cylindrical engraving attachments and other work holding devices. A rough milling attachment is available for the Model GK 21.

The GK 12 Miller is fitted with a smaller and lighter pantograph, making it ideal for delicate engraving, light milling and the production of dies for plastic molding or die casting.

The GK 21 Miller has a larger pantograph and heavier cutter spindle assembly to increase the metal cutting capacity; to permit rough milling and to copy mill dies and molds up to 550 lbs.

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

Other Deckel Machines for Tooling and Production
UNIVERSAL MILLERS
2 DIMENSIONAL ENGRAVERS
3 DIMENSIONAL ENGRAVERS
UNIVERSAL TOOL & CUTTER GRINDERS

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

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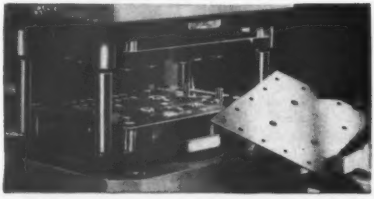
New • Fast • Proven

LOW COST methods for PERFORATING and NOTCHING SHEET METALS

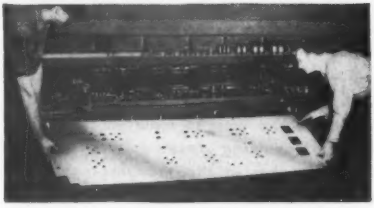
Both methods feature: LOW DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION** – Down time is minutes as compared to hours for change-over. For precision work in all types and sizes of presses. **START PRODUCTION at once.** Pierce up to ¼" thick mild steel. Saving money in the best known plants.

Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized units hold the retainers. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler *ADJUSTABLE* Dies on ⅛" steel perforating and notching job, using Tee slotted die set. With Whistler Punch and Die units production starts within hours instead of, weeks. Last minute job changes made quickly.



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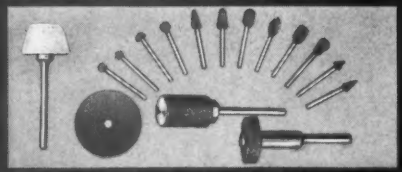

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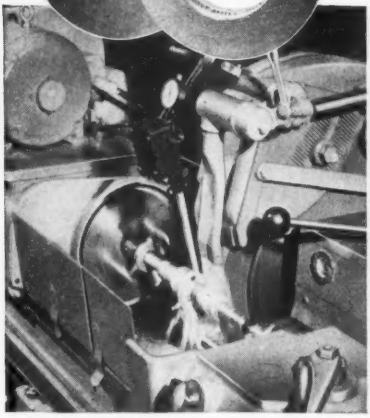

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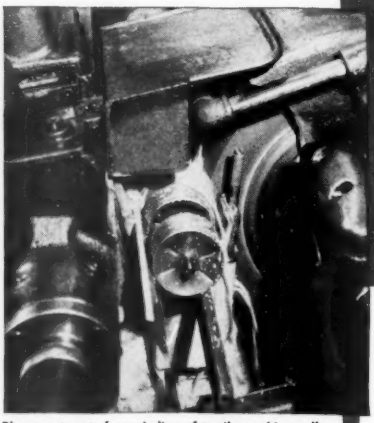

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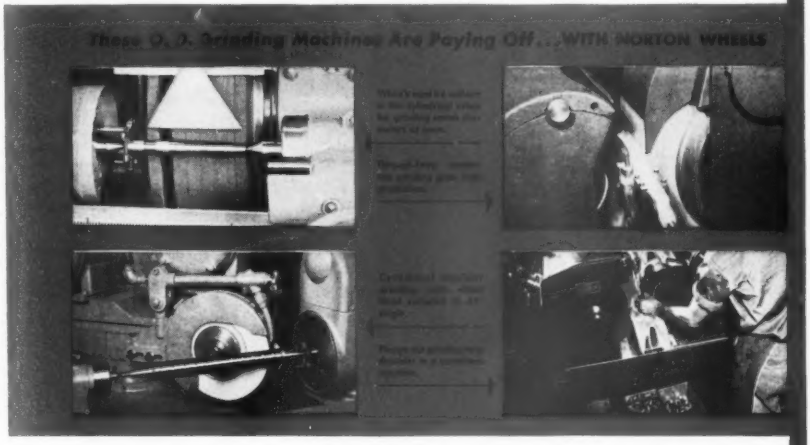

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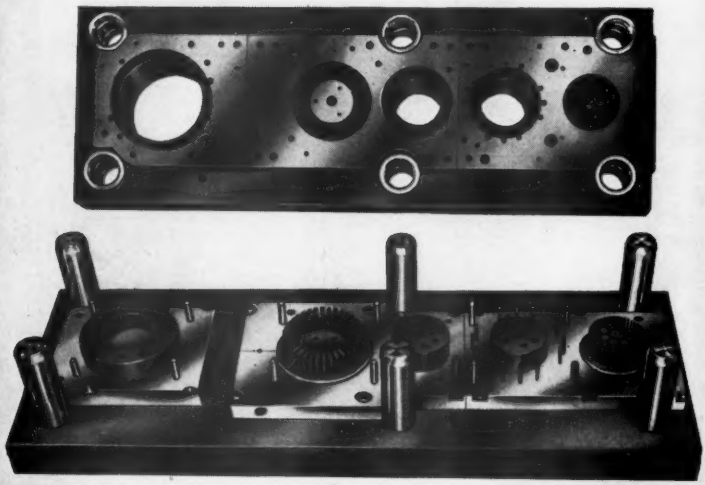

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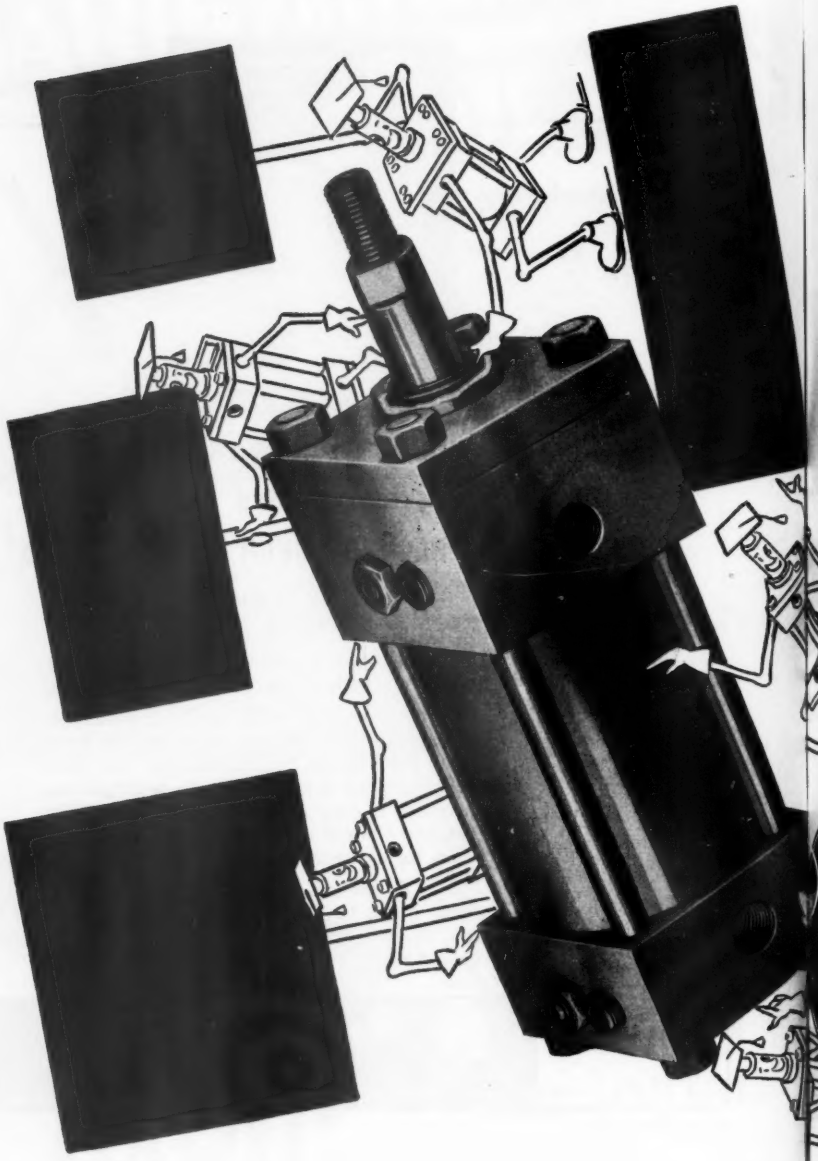

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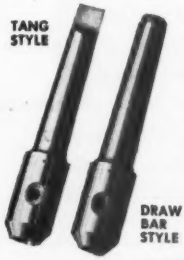

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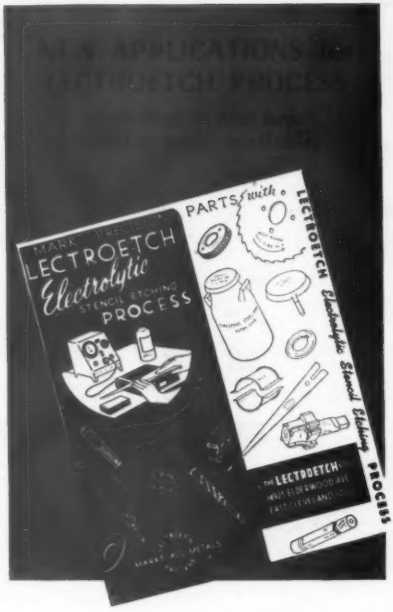

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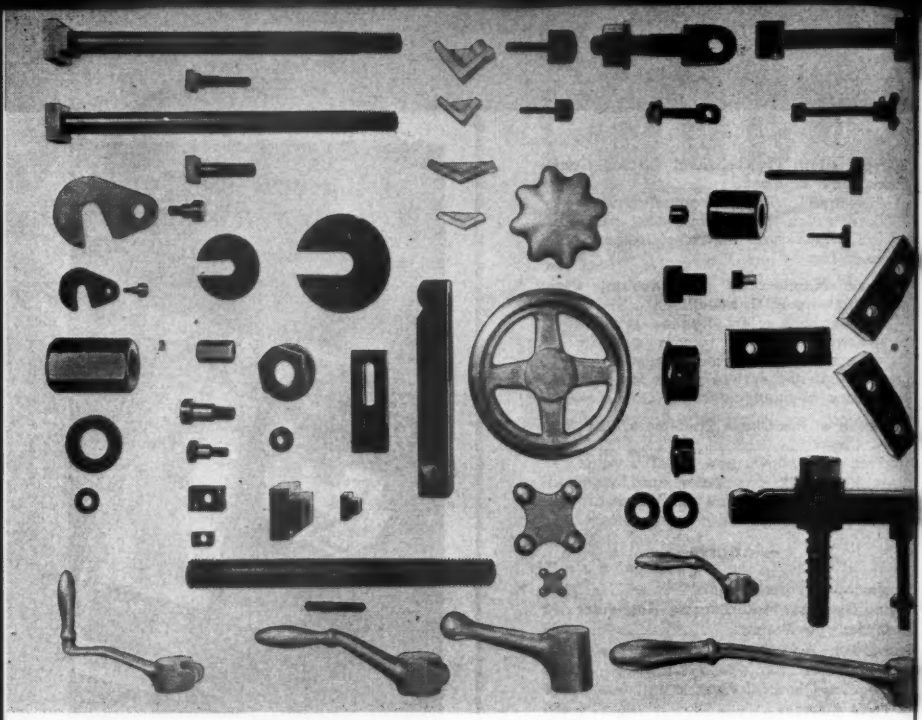

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editorial

die engineering and the die engineer

For years, the book "Die Designing and Estimating" has been an industrial best seller. For the apprentice diemaker it served as an authentic guide to acquiring the skills that are generally recognized as constituting the elite of metalworking craftsmanship. To the established and pastmaster die engineer it served as a refresher or, to borrow from the moving picture art, a "flashback" of the fundamental principles and practices which can be so helpful when undertaking a new press tool design project.

For many months this book has been out of print. Nevertheless, due to "word of mouth advertising," to training program needs, and to increasing demands on the die engineering fraternity, inquiries and orders for the book have come in and piled up in rather embarrassing volume.

Many readers will welcome the news that we are well into the job of revising, enhancing and enlarging "Die Designing and Estimating" and that its fourth edition will soon be available.

This announcement makes us mindful of a tribute to the die engineer that we have long wanted to pay.

To engineer and produce a metal part involves, by one technique or another, taking off, putting on, forming and joining, singly or in combination.

In end result, the die engineer takes a (figuratively) poor, unsuspecting piece of metal and by means of his skillfully designed dies, punches, holddowns, strippers and draw rings, plus a few hundred tons of brute press power, forces the metal to do what no self-respecting piece of metal wants to do; things which the metal resists doing very, very strenuously.

To the die engineer this means that the reason it may take a force equivalent to 50 tons to form a piece of metal, is because that piece of metal doesn't want to be formed and has a 50-ton ability to protest.

When we consider all of the actions and reactions that result from a single press stroke whereby flat metal is forced into cavities, pulled around corners, perforated and severed, we appreciate the extensiveness of the know-how that is essential to the die engineer in order that he may visualize, design and build the tools which will nurse the metal along and finally bulldoze it into shape.

He must know the molecular structure of metal because this determines its behavior and its compatability to the job in hand. He must know and be able to anticipate the changes in the molecular structure of the metal which will be caused by the punishment inflicted on the metal by his press tooling. The metal can be "cold worked" just so far before it gives up and ruptures. So, the die engineer must know when to apply heat as a "persuader."

Thus, the man who has mastered the art of designing and building press tooling has come to have the combined attributes of engineer, metallurgist and mathematician.

He must know the mathematics and geometry of changing shapes, and the engineering and metallurgy of stress and fatigue, cold-working and normalizing.

He stems from the old craftsmen who "fashioned" a piece of metal into an object of beauty or utility. It is the die engineer's application of today's science and mechanics to the fashioning of a piece of metal that has made possible the tremendous output of the stamping press.

To the die engineer—our respect and admiration.

E. Willard Pennington

editor

Gears and Stampings De-Burred by Wet Tumble Grinding

When the Ford Motor Company equipped its new automatic transmission plant in Cincinnati, Ohio, two separate groups of the latest designed Roto-Finish barrels with auxiliary equipment for burr removal were installed. These were installed for the important reason that all transmissions of this type require close fitting parts of high precision. It follows that burrs must be eliminated because, if they are not and come free in service, serious difficulties may result.

by **Herbert Chase, M. E.**
Forest Hills, N. Y.

Hand deburring or the application of brushes or other mechanical devices that involve individual processing of each piece are too slow and too expensive. Moreover, they do not yield uniform results. Bulk handling is much more economical and, as practiced by Ford, uniform results are obtained. Every batch of parts of a given design and in a given initial condition receives the same treatment, as processing is done under written schedules that specify the tumbling media, weight of parts per barrel compartment, time of tumbling, barrel rpm and other factors that affect the results obtained.

Parts treated fall into two general classes, namely (1) steel stampings, of which typical examples are shown in Figure 1, and (2) steel parts of heavier section made from bar stock or forgings; including several gears and other pieces on the order of those shown in Figure 2. Most parts in the second classification are heat-treated and those that have scale on the surface are first descaled in the same barrels used for deburring.

Deburring is done, of course, after stamping or other machine work and it does not mar machined surfaces, even if they have been ground. This is because tumbling is done wet in rubber lined barrels, using a suitable media and at rotary speeds so slow that no marring impacts occur on surfaces or sharp edges. Parts are not thrown about in the barrel but are subjected to a gentle sloshing action that is sufficient, however, to cause the abrasives to remove burrs. There is some scouring action on all surfaces but no significant dimensional changes occur.

In all, 28 different stampings are deburred in Roto-Finishing equipment. These range in lots from 100 large pieces to 43,000 small pieces. In general, the load of parts is either 250 lb or two cubic feet per barrel compartment,

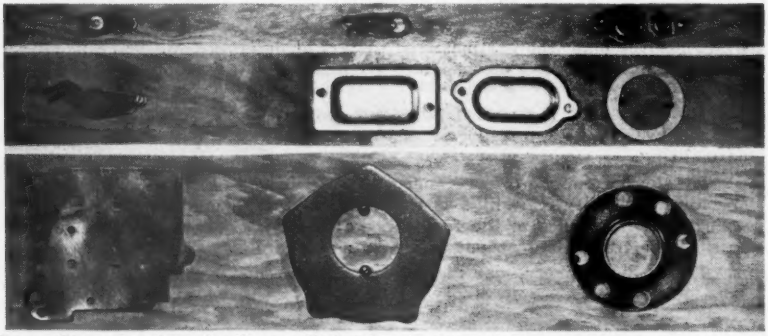

Fig. 1. These stampings, for the new Ford automatic transmission are typical of those deburred by the Roto-Finish methods described in the text.

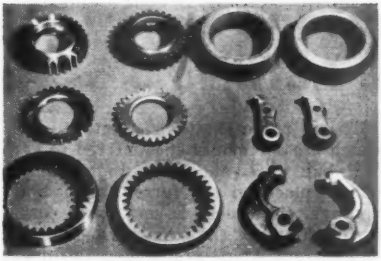

Fig. 2. Precision machined parts like those pictured are deburred effectively by wet tumbling at the proper speed in rubber lined barrels with properly chosen abrasives. Descaling is also done in the same barrels.

whichever is smaller. In other words, 250 lb of a given part are weighed out and run in a given charge unless the volume they occupy is over 2 cu ft, in which case the volume is reduced to 2 cu ft.

Before the parts are charged, however, the grinding media is placed in the barrel. It consists of 1000 lb of Coruloy chips, 3 lb of No. 11 Roto-Finish compound and enough water to cover the load. Parts are then placed on top of the chips, compartment covers are locked in place and barrels are started. For all save two of the stampings, barrel speed is 20 rpm. The two exceptions are somewhat fragile parts that may be damaged at 20 rpm so that the barrels are rotated at only 10 rpm.

Time in the barrels varies somewhat depending upon the size of burrs. The average run is about 100 min. but, if the burrs are heavy, longer runs up to about 200 min. may be needed. This applied to barrels that rotate at 20 rpm. For those that are run at 10 rpm the time is about 120 min. in an average case, when burrs are light.

Three different sizes of chips are used, Nos. 3, 4 and 5. In general, the largest size that will reach into inside corners or radii where burrs must be removed is chosen, unless this size is one that results in chips sticking in holes or recesses. In the latter case, a smaller size is used.

When the run is completed, barrels are flushed out with water, to remove the compound, after which the load is dumped onto a screen that permits the chips to pass through and catches the parts on top. This is commonly done in the mechanical separator, Figure 3. Parts are then transferred to metal baskets and are dipped in one of the two tanks, lower right in Figure 3. One of these contains one part Actusol to two parts of water. This is a temporary rust inhibitor and is used on parts that go at once to assembly. Parts that go to storage are dipped in a solution of Rust-Veto in the second tank.

As the chips wear and occasionally break, they are put through screens that sift out the smaller sizes and regrade them as to size before re-use. All handling of chips and much of the handling of parts is done in dump pans conveyed by an electric hoist on a light crane trolley, as shown in Figure 4. Pans not in use are placed below the revolving bar-

(Continued on page 88)

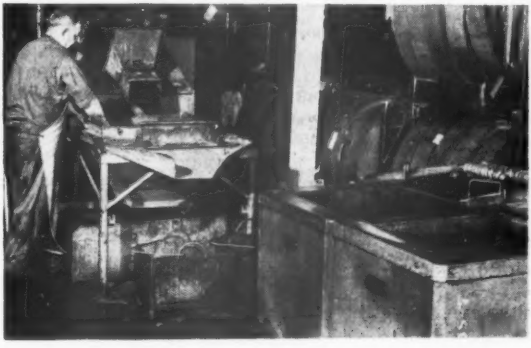

Fig. 3. Stampings are separated from the chips used for wet tumbling in the shaker screen at left. At the right, are tanks in which tumbled parts are dipped in rust inhibiting solutions.

How to Run Small Lots On Turret Lathes

A valuable characteristic of the modern turret lathe is its ability to produce short-run work efficiently. To accomplish this, the machine itself is supplemented by a complete array of standard tools and attachments, the effective use of which depends upon an understanding of their relation to the principles of Turret Lathe Practice. For example, consider the layout of tooling for producing small to medium size job lots.

Figure 1 illustrates how the hexagon turret of a bar machine should be arranged so that setup time can be held to a minimum in changing from one job to another. Station A, an almost universal station in bar tooling, consists of a flanged tool holder with a combination stock stop and starting drill. Station C houses an easily set roller turning tool for reducing bar diameters to close limits of size and finish. Station B holds a short flanged tool holder in which a die head is mounted for use over a range of thread sizes.

These three stations contain tools which are commonly encountered in general bar work and may, therefore, be left in place on the turret to good advantage. Station D, E, and F are equipped with any of the standard tools listed in Figure 1 which are needed to fill out the requirements for any particular setup. Centering, drilling, reaming, tapping, supplementary turning, knurling, recessing, etc., may be performed in these stations.

A comparable arrangement of tools may be established for chucking work. Figure 2 illustrates a hexagon turret with basic tools in place in stations A, B and C. Station A contains a heavy duty multiple turning head with overhead piloting for rapid metal removal. The turning head is designed with holes spaced so that shank-type tool holders can be set to accommodate work diameters up to the capacity of the machine. The mutiple turning head is equipped with a center hole so that centering,

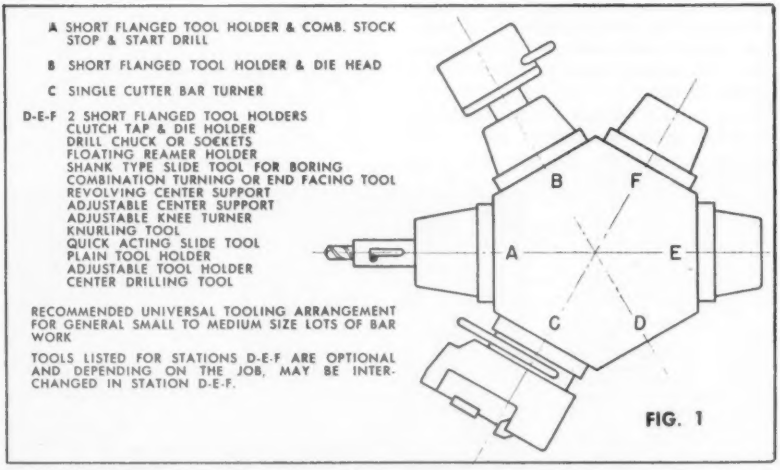
A SHORT FLANGED TOOL HOLDER & COMB. STOCK STOP & START DRILL
B SHORT FLANGED TOOL HOLDER & DIE HEAD
C SINGLE CUTTER BAR TURNER
D-E-F 2 SHORT FLANGED TOOL HOLDERS
CLUTCH TAP & DIE HOLDER
DRILL CHUCK OR SOCKETS
FLOATING REAMER HOLDER
SHANK TYPE SLIDE TOOL FOR BORING
COMBINATION TURNING OR END FACING TOOL
REVOLVING CENTER SUPPORT
ADJUSTABLE CENTER SUPPORT
ADJUSTABLE KNEE TURNER
KNURLING TOOL
QUICK ACTING SLIDE TOOL
PLAIN TOOL HOLDER
ADJUSTABLE TOOL HOLDER
CENTER DRILLING TOOL
RECOMMENDED UNIVERSAL TOOLING ARRANGEMENT FOR GENERAL SMALL TO MEDIUM SIZE LOTS OF BAR WORK
TOOLS LISTED FOR STATIONS D-E-F ARE OPTIONAL AND DEPENDING ON THE JOB, MAY BE INTERCHANGED IN STATION D-E-F.
B
F
A
E
C
D
FIG. 1

Fig. 1. The hexagon turret of a bar machine arranged so that setup time can be held to a minimum in changing from one job to another.

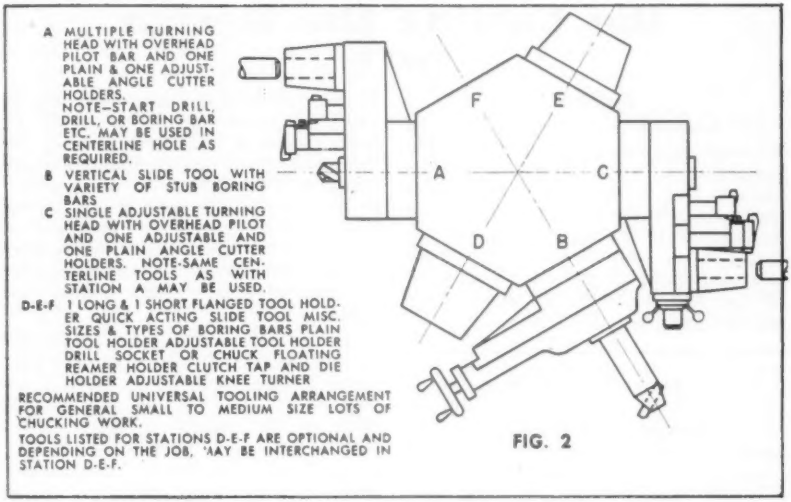
A MULTIPLE TURNING HEAD WITH OVERHEAD PILOT BAR AND ONE PLAIN & ONE ADJUSTABLE ANGLE CUTTER HOLDERS. NOTE—START DRILL, DRILL, OR BORING BAR ETC. MAY BE USED IN CENTERLINE HOLE AS REQUIRED.
B VERTICAL SLIDE TOOL WITH VARIETY OF STUB BORING BARS
C SINGLE ADJUSTABLE TURNING HEAD WITH OVERHEAD PILOT AND ONE ADJUSTABLE AND ONE PLAIN ANGLE CUTTER HOLDERS. NOTE-SAME CENTERLINE TOOLS AS WITH STATION A MAY BE USED.
D-E-F 1 LONG & 1 SHORT FLANGED TOOL HOLDER QUICK ACTING SLIDE TOOL MISC. SIZES & TYPES OF BORING BARS PLAIN TOOL HOLDER ADJUSTABLE TOOL HOLDER DRILL SOCKET OR CHUCK FLOATING REAMER HOLDER CLUTCH TAP AND DIE HOLDER ADJUSTABLE KNEE TURNER
RECOMMENDED UNIVERSAL TOOLING ARRANGEMENT FOR GENERAL SMALL TO MEDIUM SIZE LOTS OF CHUCKING WORK.
TOOLS LISTED FOR STATIONS D-E-F ARE OPTIONAL AND DEPENDING ON THE JOB, MAY BE INTERCHANGED IN STATION D-E-F.
F
E
A
C
D
B
FIG. 2

Fig. 2. A hexagon turret is shown with an arrangement of basic tools for chucking work. A heavy duty multiple turning head with overhead pilot bar is used for rapid metal removal.

drilling, boring, counterboring, and like operations can be accomplished in combination with overhead tooling.

Station B is reserved for an adjustable slide boring tool in which various size stub boring bars are mounted. By virtue of the easy adjustment, this tool may be used for single point roughing or finishing operations where surface generation is desirable. Ordinarily, a tool of this type is fitted with positive adjustable stops so that the boring tool may be used in two positions during any one setup.

Station C houses an adjustable single turning head with overhead pilot in which tool holders are mounted in a manner similar to the plain turning head in Station A. One of the tool holders in the single turning head is mounted in a rugged slide which is adjusted for range and size control.

In effect, the adjustable slide provides a second cross slide for the machine in that the tool and its holder may be left in place in the turning head from job-to-job. A turning cut from the hexagon turret may, therefore, be set up in combination with a cut from the standard cross slide carriage with no appreciable increase in setup time.

This principle of combining cuts between the hexagon turret and cross slides on a turret lathe bears repeating because it is probably the one basic principle of turret lathe practice—resulting in low cost production—which is least often considered for short-run production.

As with the turret arranged for bar tools, the turret used for chucking work also has three blank stations, D, E and F, in which the miscellaneous standard tools listed in Figure 2 can be mounted. Tools in these stations may be used for additional turning cuts, drilling, reaming, tapping or threading, recessing, etc.

Figure 3 illustrates a typical bar or shaft job which can be tooled efficiently in accordance with the basic turret arrangement for bar tools. No part sketch is furnished for this bar job since it is intended only to illustrate the method and application of a basic tooling arrangement to a general class of work.

This particular type of bar job is one where the length of the finished part is

(Continued on page 96)

Die Casting Die Design

Part V.

Overflows

An "overflow", variously termed by different die casting engineers and designers as a "well", "pocket", "flow-in-pad", and/or "reservoir", is a separate cavity cut into the face of a die casting die adjacent to the main cavity and connected to the main die cavity by means of a channel which permits molten alloy to flow into it directly from the main die cavity as the latter fills.

by H. K. Barton
and
James L. Erickson

The overflow is most frequently utilized to perform one or more of the following functions:

(1) To perform the same function as a "blind-runner", which is used to increase the total mass of hot metal in some specific area of the die face. This procedure is resorted to when there is need to raise the average surface temperature thereby preventing the occurrence of those typical defects which manifest themselves in a die casting which has been cast in too cold a main die cavity.

(2) To perform the function of balancing the thermal conditions within any given die (when it becomes necessary to resort to the use of some method to raise the average die temperature of a particular area of the die) and when, because of the geometric relation of that area requiring additional heat to the main cavity and the sprue, it is not feasible to employ a blind-runner.

(3) To act as a collection pocket for the molten alloy which otherwise might chill, or lose heat by the time it reached a certain section of the main die cavity. A completely filled die cavity is necessary to form a smooth surface finish on the part being die cast.

(4) To act as a collecting pocket for air entrapped within the main die cavity. In this instance the entrapped air, instead of remaining in the main die cavity where it engenders porosity and incomplete-fill in the resultant die casting thus causing it to be unacceptable, is forced out of the main die cavity into the overflow. Here its presence, of course, is harmless, since the overflow metal is subsequently detached from the die cast part proper and melted over again.

(5) To act as a means for causing the die casting, once formed within the main die cavity, to cling, as it were, to the movable die half during the opening cycle of the casting operation rather than to stick to the stationary die half.

(6) To act as a "lifter", or more precisely, a pad against which an ejector pin may push during the ejection of the die casting. In cases where it is either impossible or difficult to position an ejector pin beyond a section of the main die cavity (due perhaps to the fact that the die casting has a thin wall, or perhaps due to the fact that it is desirable to avoid blemishing the surface of the die casting) an overflow may be cut into

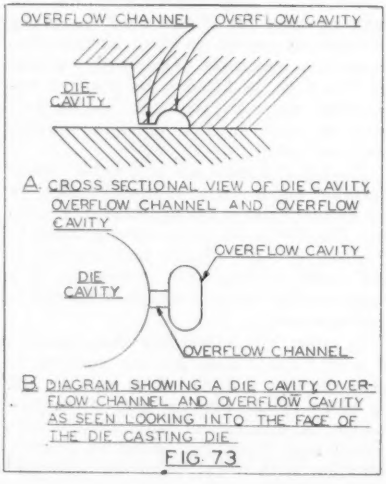
OVERFLOW CHANNEL
OVERFLOW CAVITY
DIE CAVITY
A. CROSS SECTIONAL VIEW OF DIE CAVITY OVERFLOW CHANNEL AND OVERFLOW CAVITY
OVERFLOW CAVITY
DIE CAVITY
OVERFLOW CHANNEL
B. DIAGRAM SHOWING A DIE CAVITY OVERFLOW CHANNEL AND OVERFLOW CAVITY AS SEEN LOOKING INTO THE FACE OF THE DIE CASTING DIE

FIG. 73

the die adjacent to the main die cavity section at a point where it is necessary to apply a force of ejection to the die casting. The ejector pin may then be situated so that it will push on this overflow. Since the overflow is joined to the die casting by means of a bridge of solid metal, any ejection force applied to an overflow will tend to exert a force of ejection on the die casting as well.

(7) To act simultaneously as one or more of the foregoing, i.e., as a means of heating some portion of the die and as a collection cavity for entrapped air, and/or as an ejector pad or "lifter".

We will elaborate on each of these functions subsequently; before doing so however, let us examine in greater detail the physical nature of an overflow and where it may be located on the face of either or both die halves.

Design of Overflows and Their Location

Very simply, an overflow is a cavity cut into the face of the die casting die, or the face of a stationary or movable core, adjacent to the main die cavity wherein the die casting proper is made. It is connected to the main die cavity by a channel.

On the whole the precise size and shape of an overflow are unimportant and these characteristics of the overflow are determined by (1) the function the overflow is intended to perform, (2) the amount of space available for its location, (3) the die half into which it is to be cut (provided it is cut in only one half), (4) the method employed to cut the overflow into the die face, i.e., by high speed air grinder or by a milling operation, and (5) the contour of the die cavity next to which the overflow is situated.

If an overflow is employed to collect entrapped air, the overflow's size will be governed by the volume of the entrapped air that need be forced out of the main die cavity into the overflow. Obviously if the die casting is small, say the size of a silver dollar, the overflow itself, if one need be employed at all, does not have to be large; however, if the casting is say .156 x 12 x 12 inches and the portion of the die casting to be freed of entrapped air is large, the overflow itself must be comparatively large. A practical rule for determining the size of an overflow is: Make the overflow volume equal to twice the volume of that portion of the die casting to be cast free of porosity.

When an overflow is employed as a means of increasing the temperature of the die at some particular spot, the size of the overflow will depend upon how much additional heat is needed in this vicinity in order to raise the average surface temperature of the die face to the temperature desired. Too small an overflow will not produce sufficient temperature rise, while too large an overflow may increase the temperature excessively, with the possible adverse effect of causing local overheating of the die.

In order for the overflow to function as an ejector pad, it need only be large enough to receive the face of the ejector pin and as much larger as might be necessary to form a strong bond between itself and the die casting to which it is connected.

When putting an overflow in a die casting die after the die has been built and its trial run has been completed, it may be found necessary to place the overflow in a specific location that does not permit its being very large in area, and yet it may be required that the overflow be of large volume; in such instances the overflow may be given greater depth in order to increase its volume.

The better method for putting overflows in a die casting die is to machine them in instead of grinding them in. For

(Continued on page 76)

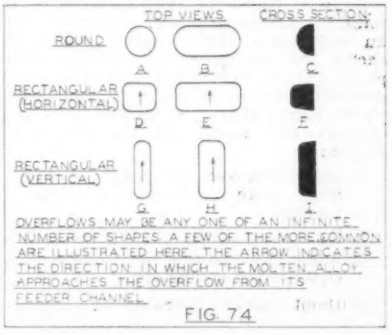

FIG. 74

How to Figure—

Angular Setups for Machining

For a machining operation, trial and error is ordinarily used to orient an inclined plane of a workpiece into the proper position on a machine tool. This process is wasteful of time and often results in spoiled work. This article attempts to correct the situation by describing in detail some simple mathematical methods for calculating the angles required to rotate the inclined plane into the horizontal. Numerical examples accompany all the mathematical developments.

by **Prof. M. F. Spotts**
Northwestern University
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Angular Setups for Machining

In Figure 1, assume that the inclined plane $P_1P_2P_3$ must be properly located for machining. This will necessitate rotating the body until plane $P_1P_2P_3$ is in the horizontal. Furthermore, suppose that surrounding material obstructs any overrun of the cutter or grinding wheel across line P_1P_2. This line must, therefore, be made parallel to the ways of the machine. The plane under consideration may, of course, have any shape whatever. It is only necessary that its location in space be known, and for this it is assumed that the Cartesian coordinates for any three points of the plane are obtainable. The locations of the sides of the workpiece, with respect to the three points, P_1, P_2, P_3, or their projections, O_1, O_2, O_3, will also be known. It will, therefore, be necessary to deal only with solid $P_1P_2P_3O_1O_2O_3$ in Figure 1.

Milling Machine or Planer

Suppose the work is to be done on a milling machine or planer equipped with an adjustable angle plate. Figure 2 shows the workpiece in position with plane $P_1P_2P_3$ horizontal, and line P_1P_2 parallel to the ways of the machine. This figure shows that it is necessary to determine the values of the following angles:

- ϕ, angle between the hinge of the angle plate and the ways of the machine.
- θ, inclination of the angle plate.
- ψ, angle between the hinge and side O_1O_2 of the workpiece.

Without loss of generality, the coordinates for P_1, P_2, P_3 can be taken so that P_1 lies in the xy-plane, P_2 lies in the yz-plane, and P_3 lies in the zx-plane. In addition, side O_1O_2 is taken parallel to the x-axis. Plane $P_1P_2P_3$, when so located, is shown in Figure 3. Some of the coordinates will be zero, as shown, and simplifications of the algebra will result.

Line P_2H_2 is the intersection of a horizontal plane at elevation z_2 with plane $P_1P_2P_3$. Rotation about P_2H_2 will bring $P_1P_2P_3$ into the horizontal; line P_2H_2 is, therefore, parallel to the hinge of the angle plate and is accordingly marked "hinge" in Figure 3.

Line S_1H_1 in Figure 3 is the projection of P_2H_2 in the xy-plane. P_1M_1 is a perpendicular dropped from P_1 to S_1H_1 extended. Point M_2 lies directly above M_1 on the extension of P_2H_2.

The three angles ϕ, θ, and ψ of Figure 2 will appear at the locations shown in Figure 3. Angle ϕ is the angle between P_2H_2 and P_1P_2, since these lines are respectively parallel to the hinge and to

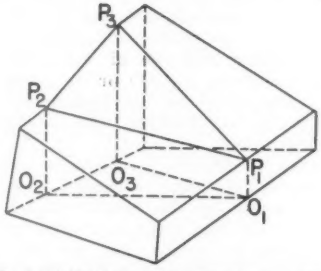


Fig 1. Workpiece With Surface $P_1P_2P_3$ To Be Machined

This paper, by Professor Spotts, was contributed by the Production Engineering Division for presentation at the Fall Meeting, Minneapolis, September, 1951, of the American Society of Mechanical Engineers. Courtesy, ASME.

the ways. Angle $M_2P_1M_1$ or θ is the angle required to bring $P_1P_2P_3$ into the horizontal; hence, it is equal to the inclination of the angle plate. Angle ψ is the angle between P_1S_1, or side O_1O_2, and the projection of the hinge.

(a) Solution by Tetrahedron

Figure 4 shows the xy-plane of Figure 3. Since the locations of points P_1, S_1, and R_1 are known, the various lengths on this figure can be easily computed by trigonometry. Angle ψ can be found from the following equation:

$$\tan \psi = \frac{N_1H_1}{N_1S_1} \qquad (1)$$

From Figure 3, the following equation can be written for finding θ:

$$\tan \theta = \frac{Z_2}{M_1P_1} \qquad (2)$$

Angle γ which is needed in subsequent calculations is given by:

$$\tan \gamma = \frac{z_2}{x_1} \qquad (3)$$

Consider tetrahedron $S_1M_1M_2P_2P_1$ in Figure 3:

$$P_2M_2 = S_1M_1 = P_1S_1 \cos \psi$$

$$P_2P_1 = \frac{P_1S_1}{\cos \gamma}$$

$$\cos \phi = \frac{P_2M_2}{P_2P_1}$$

When the first two of the foregoing equations are substituted in the third,

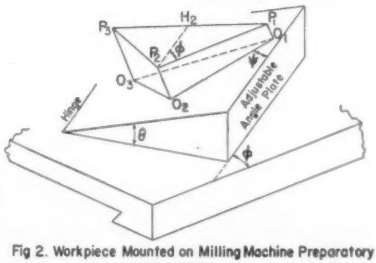


Fig 2. Workpiece Mounted on Milling Machine Preparatory to Machining

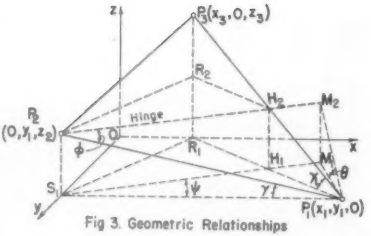


Fig 3. Geometric Relationships

the following equation for finding ϕ is obtained.

$$\cos \phi = \cos \psi \cos \gamma \qquad (4)$$

Example 1. Let the x, y, and z coordinates for the three points be as follows: P_1(7.78, 4.32, 0), P_2(0, 4.32, 1.65), P_3(1.97, 0, 3.36).

Find the values of angles ϕ, θ, and ψ.

Solution. By elementary trigonometry, which need not be reproduced here, it is found that $N_1H_1 = 2.12143$ in., $N_1S_1 = 4.92687$ in., and $M_1P_1 = 3.07683$ in. Hence:

In Equation (1),

$$\tan \psi = \frac{N_1H_1}{N_1S_1} = \frac{2.12143}{4.92687} = 0.430$$

$$\psi = 23.2959°$$

In Equation (2),

$$\tan \theta = \frac{z_2}{x_1P_1} = \frac{1.65}{3.07683} = 0.536$$

$$\theta = 28.2031°$$

In Equation (3),

$$\tan \gamma = \frac{z_2}{x_1} = \frac{1.65}{7.78} = 0.212$$

$$\gamma = 11.9740°$$

In Equation (4),

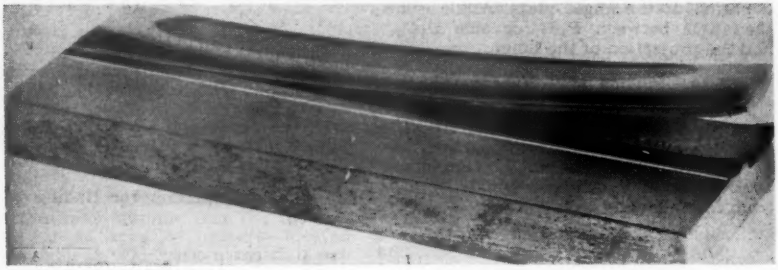
$$\cos \phi = \cos \psi \cos \gamma = 0.918 \times 0.978 = 0.898$$

$$\phi = 26.0397°$$

Additional tetrahedron equations are given in reference (1) bibliography.

(Continued on page 58)

Fig. 1. A steel workpiece, the front half of which was ground by "Cool Grinding," and the back side of which was ground dry, using a fast table speed and taking a very heavy cut. The result of the extreme heat generation on the back side is readily visible.



"Cool Grinding" Prevents Tool Failure

Much has been written on the subject of physical damage which occurs when tools are improperly ground. Usually, this damage consists of either or both cracking and/or "skin" softening. Almost always, this damage cannot be seen with the naked eye, and requires laboratory inspection such as Rockwell, Magnaflux and acid-etch tests in order to determine the extent of harm done. Many tools may have near-perfect finish, dimension and flatness, when given a visual inspection, but may actually be so abused in the grinding process as to be of little or no value in actual operation.

In every case, all of the damage is caused by one factor — too much heat generated between the grinding wheel and the workpiece.

Minute surface cracks can be caused, so tiny that they cannot be seen. However, they provide a good starting point which may eventually grow until a die or other tool actually breaks into two or more parts while in use. Sometimes the breakage might even occur when the die is at rest on a shelf. In some cases the breakage happens immediately, as any grinder hand can attest who has had the experience of grinding a die, removing it from the grinder and finding to his surprise that while he placed only one piece on the chuck, there are now two.

by **H. Pottle**
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The other type of damage, "skin softness," is not so easily noticed, but can be just as costly. In every case, the steel selected for any tool is selected according to its various properties for any particular job. The metallurgist has provided a suitable alloy, and the heat-treater has carefully brought this alloy to exactly the proper hardness and toughness to withstand the shock, heat, strains and stresses to which it is to be subjected. However, all of this skill may be lost through improper grinding, for too much heat can and usually does soften the surface to a depth which can go as far into the material as .030". Naturally, a soft cutting edge is a poor one, for it rapidly becomes dull and needs resharpening. Unless it is badly burned, you cannot "see" a soft surface, but the constant delays for resharpening can be seen in the profit-and-loss statement.

Grinding damage, since it is rarely seen or recognized, is an insidious factor which wastes many hundreds of thousands of dollars and man-hours. Occasionally it erupts into full view, as for instance in Figure 1, which shows a six-inch piece of 52-100 steel, hardened to 65 Rockwell C. The front half of this piece was ground using recommended speeds and feeds and using DoALL's new "Cool Grinding" (U. S. Patent #2470350) technique to keep the work cool. In this system the coolant is forced directly

Fig. 2. In ordinary grinding, the air blast created by the grindng wheel tends to keep coolant away from the wheel.

through the wheel, from inside out, making sure that each cutting particle in the wheel is provided with coolant.

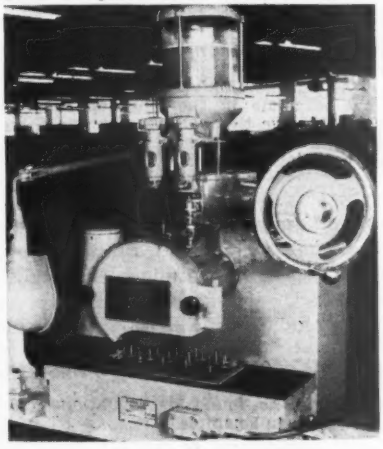
The back side of this piece was ground dry, using a fast table speed and taking a very heavy cut. In doing so, a great amount of heat was generated, the result of which is easily apparent. However, there is no basic difference between this crack and the ordinary minute surface cracks ordinarily found wherever work is improperly ground. This example of grinding damage occurred in The DoALL Company experimental laboratory during comparative tests of various types of coolant systems, and also grinding without coolant. It provides a graphic example, in magnified form, of what happens to an improperly ground tool.

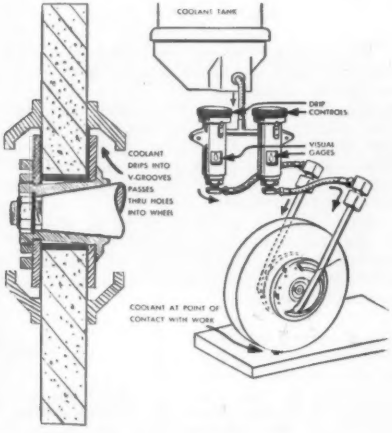
Since it is heat which causes practically all grinding difficulties, then anything which will reduce grinding temperatures is certain to provide better results. The ordinary way to do this is to pump a coolant solution onto the workpiece while it is being ground. This serves the purpose of carrying away some of the heat, but in most cases there is *no coolant* at the point where it *is* needed—under the grinding wheel—for the air blast created by the wheel, Figure 2, keeps the coolant away.

With DoALL's new "Cool Grinding" technique the coolant is carried *directly through the wheel*, as shown in Figure 3 where each cutting particle is thoroughly saturated. In grinding, just as in any machining operation, increased production and longer tool life are obtained if the cutting tools are cooled. Each abrasive grain is an individual tool such as the bit in a production lathe, and if it receives a constant flow of coolant, it cuts faster, lasts longer and produces a better surface. In feeding the coolant *through* the wheel, centrifugal force provides the power, atomizing the solution and flushing the wheel to prevent loading and glazing. An optical pyrometer reveals that the actual cutting temperature may be as much as 600 degrees cooler

(Continued on page 116)

Fig. 3. At left is the "Cool Grinding" equipment that carries the coolant directly through the wheel. The process is outlined at the right.




COOLANT TANK
DRIP CONTROLS
VISUAL GAGES
COOLANT DRIPS INTO V-GROOVES PASSES THRU HOLES INTO WHEEL
COOLANT AT POINT OF CONTACT WITH WORK

. . . How to Figure, from page 55

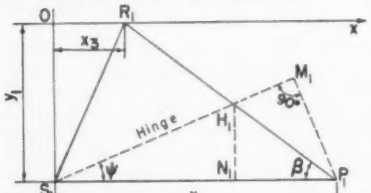


Fig 4. Geometric Relationships

(b) Solution by Analytical Geometry

Any equation of the first degree in x, y, and z represents a plane. Thus:

$$Ax + By + Cz + D = 0 \quad \ldots\ldots (5)$$

Assume the plane is determined by the three points $P_1(x_1, y_1, z_1)$, $P_2(x_2, y_2, z_2)$, and $P_3(x_3, y_3, z_3)$. The coefficients A, B, C, and D can be found by substituting the coordinates of P_1, P_2, P_3 in Equation (5). Three equations in A, B, C, and D will be obtained which may be solved for three of the coordinates in terms of the fourth. When these are substituted in Equation (5), this remaining coordinate will cancel out and the equation of the plane will result.

Angle θ lying between plane $P_1P_2P_3$ and the xy-plane can be found from the following equation:

$$\cos\theta = \frac{C}{\pm\sqrt{A^2 + B^2 + C^2}} \quad (6)$$

The sign for the radical in the denominator should be taken opposite to that of D in Equation (5). In analytical geometry, angle θ is the angle between the positive z-axis and the perpendicular drawn from the plane to the origin. The sign of the cosine in Equation (6) will then indicate whether the angle is acute or obstruse.

The equation for line S_1H_1 in Figure 4 can be found by setting $z = z_2$ in Equation (2). Division by the absolute term will put the equation in the following form:

$$\frac{x}{a} + \frac{y}{b} = 1 \quad (7)$$

Here a is the intercept on the x-axis and b is the intercept on the y-axis. Hence:

$$\tan\psi = \frac{b}{a} \quad \ldots\ldots (8)$$

Values for γ and ϕ can be found by Equations (3) and (4) respectively.

Example 2. Use the data of Example 1 to solve for the angles by the method of analytical geometry.

Solution. The coordinates of the three points, when substituted into Equation (5), will give the following equations:

$$7.78A + 4.32B + D = 0$$

$$4.32B + 1.65C + D = 0$$

$$1.97A + 3.36C + D = 0$$

These equations can be solved for A, B, and C as follows:

$$A = -0.056\,139D$$

$$B = -0.130\,379D$$

$$C = -0.264\,704D$$

When these are substituted into Equation (5), the following equation will result:

$$x + 2.322\,y + 4.715\,z - 17.812 = 0$$

Substitution into Equation (6) gives

$$\cos\theta = \frac{4.715}{\sqrt{1 + 2.322^2 + 4.715^2}} = 0.881$$

$$\theta = 28.2031°$$

The substitution of $z = 1.65$ should now be made in the equation for the plane to give the equation for line S_1H_1 in Figure 4. The result can be written in the following form:

$$\frac{x}{10.03291} + \frac{y}{4.32} = 1$$

In Equation (8),

$$\tan\psi = \frac{b}{a} = \frac{4.32}{10.03291} = 0.430$$

$$\psi = 23.2959°$$

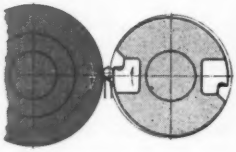
Angle ϕ is found by Equations (3) and (4) as in Example 1.

(Continued on page 60)

Idea for High Production

of precision ground parts

Cammed regulating wheel. Work is loaded and ejected at low section of wheel. Production per minute = rpm of regulating wheel.



Double cammed regulating wheel, notched for loading and ejecting the work. Production per minute = 2 x rpm of regulating wheel.

Have you considered automatic centerless grinding for your precision ground parts? The equipment illustrated here, developed by Cincinnati, shows what can be done. A CINCINNATI FILMATIC No. 2 Centerless Grinder is equipped with an automatic loading device and a cammed regulating wheel. This method of precision grinding (diagramed at the right) offers several advantages... very low cost... high rate of production... excellent finish... accurate sizing... elimination of slideway wear. ¶ For today's defense work... for future applications when the pressure on machine tools eases a bit... the cammed infeed method of centerless grinding is worth serious consideration by cost-conscious engineers in high production plants.

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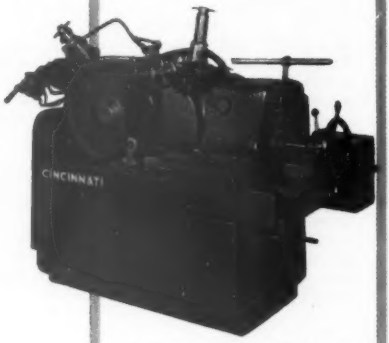

CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-591.

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CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

. . . How to Figure, from page 58

(c) Solutions by Euler's Angles

In Figure 5 (a), let axes x and y be fixed in space, and let axes x_1 and y_1 be attached to the body. Point P in the body has coordinates x_1 and y_1 with respect to axes x_1 and y_1.

Figure 5 (b) illustrates the situation after the body, together with axes x_1 and y_1 has been rotated counterclockwise through angle ϕ. The relationship

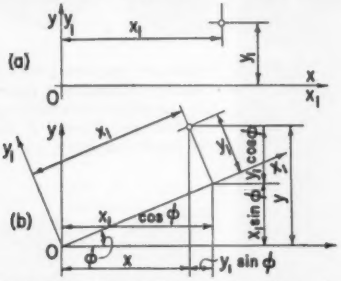

Fig 5. Rotation of Axes — Two Dimensions

between new coordinates x and y and the old coordinates x_1 and y_1 is given by the following equations:

$$x = x_1 \cos \phi - y_1 \sin \phi \quad \ldots\ldots (9)$$

$$y = x_1 \sin \phi + y_1 \cos \phi \quad \ldots\ldots (10)$$

Figure 6 illustrates similar operations of rotations of axes when conducted for three-dimensional space. As a first operation, axis z is held, and the system is rotated through angle ϕ into $x_1y_1z_1$. The relationships between new coordinates x, y, and z and old coordinates x_1, y_1, and z_1 is given by Equations (9) and (10) plus the following equation:

$$z = z_1 \quad \ldots\ldots (11)$$

The second rotation consists of keeping $0x_1$ fixed and rotating the system through angle θ into $x_2y_2z_2$. For this rotation, the new coordinates will be x_1, y_1, and z_1, and the old coordinates will be x_2, y_2 and z_2. They are connected through the following equations:

$$x_1 = x_2 \quad \ldots\ldots (12)$$

$$y_1 = y_2 \cos \theta - z_2 \sin \theta \quad \ldots\ldots (13)$$

$$z_1 = y_2 \sin \theta + z_2 \cos \theta \quad \ldots\ldots (14)$$

For the third and last rotation, $0z_2$ is held fixed and the system is rotated

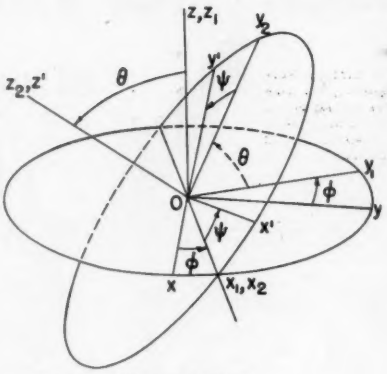

Fig 6. Rotation of Axes — Three Dimensions

through angle ψ into $x'y'z'$. New coordinates x_2, y_2, and z_2 will be connected to old coordinates x', y', and z' by the following equations:

$$x_2 = x' \cos \psi - y' \sin \psi \quad (15)$$

$$x_2 = x' \sin \psi + y' \cos \psi \quad (16)$$

$$z_2 = z' \quad \ldots\ldots (17)$$

It is now necessary to express the new coordinate x in terms of the original coordinates x', y', and z'. This can easily be done by taking Equation (9) and substituting previous equations as follows:

$$\begin{aligned} x &= x_1 \cos \phi - y_1 \sin \phi \\ &= x_2 \cos \phi - (y_2 \cos \theta - z_2 \sin \theta) \sin \phi \\ &= x_2 \cos \phi - y_2 \sin \phi \cos \theta \\ &\quad + z_2 \sin \phi \sin \theta \\ &= (x' \cos \psi - y' \sin \psi) \cos \phi \\ &\quad - (x' \sin \psi + y' \cos \psi) \sin \phi \cos \theta \\ &\quad + z' \sin \phi \sin \theta \\ &= x' (\cos \phi \cos \psi - \sin \phi \cos \theta \sin \psi) \\ &\quad - y' (\cos \phi \sin \psi + \sin \phi \cos \theta \cos \psi) \\ &\quad + z' \sin \phi \sin \theta \quad \ldots\ldots (18) \end{aligned}$$

Similar substitutions are carried out for y and z which give:

$$\begin{aligned} y &= x' (\sin \phi \cos \psi + \cos \phi \cos \theta \sin \psi) \\ &\quad + y' (- \sin \phi \sin \psi \\ &\quad + \cos \phi \cos \theta \cos \psi) \\ &\quad - z' \cos \phi \sin \theta \quad \ldots\ldots (19) \end{aligned}$$

$$\begin{aligned} z &= x' \sin \theta \sin \psi + y' \sin \theta \cos \psi \\ &\quad + z' \cos \theta \quad \ldots\ldots (20) \end{aligned}$$

(Cincluded next month)

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Method X—for Machining Sintered Carbides and Other Superalloys

A completely new method of metal removal has been developed which employs the direct utilization of electrical energy for the machining of any electrically conductive material by means of an electric spark discharge, and which does not affect the work material's physical or chemical characteristics.

by **John S. Roller**
General Manager
The Method X Company
Philadelphia, Pa.

The machining action depends on a mechanical, not thermal, effect of electricity which sets up internal mechanical stresses by the use of extremely high current densities and thereby causes the metal particles to detach themselves from the work material without resorting to melting. The exposed surfaces thus remain unchanged and surface finishes of 26 microinches rms can be obtained. Lapping of less than 0.001" will produce any desired finish down to 0.15 microinches on sintered carbide. Center to center spacing of holes through the same workpiece can be controlled to approximately 0.0005". Blind hole filet radii can be made as small as 0.002".

Broadens Application Field for "Hard-to-Machine" Metals

The fabrication difficulties of sintered carbides, superalloys, S-816, Vitalium and hardened steels have somewhat restricted their uses. Now, the Method X process not only can be used to machine conventional shapes but it extends the uses of these hard-to-machine metals by making possible the forming of complicated geometric shapes economically and rapidly and also those shapes that are not even practical with other machining methods.

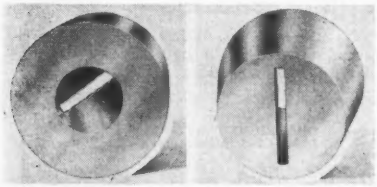

Fig. 1. This compound radial-rectangular internal shape is typical of the capability of the machine. The product is a water descaler nozzle shaped from a solid section of sintered carbide.

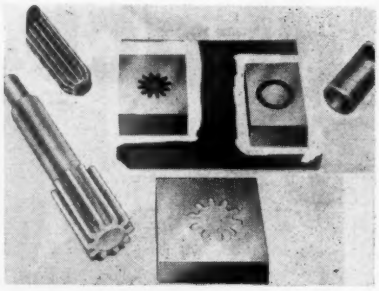

Fig. 2. Gear and ring compacting die sections produced directly in solid, sintered carbide. The punch for the gear section can also be machined in sintered carbide by using a shaped electrode as a cutting tool and shaped the splines in the conventional manner on the Method X machine. (The gear shaped electrode shown is made of brass.)

An example of this is the materials used for gas turbine blading. Blade root mounting serrations are being laboriously ground for the intricate shapes required and to extremely close tolerances. Blade sections are shaped by slow contour milling, precision casting or hammer forging. All processes are relatively slow and comparatively expensive.

Die sections of sintered carbides are generally fastened by means of threaded steel sections brazed into the carbide and secured to the backing blocks by screws. Another means of fastening die sections is to shape, drill and tap wedges to fix the carbide sections to backing blocks. Both methods are slow and costly and not entirely satisfactory since either type leaves the mountings subject to loosening due to shocks en-

(Continued on page 66)

PIECE PART REJECTIONS REDUCED

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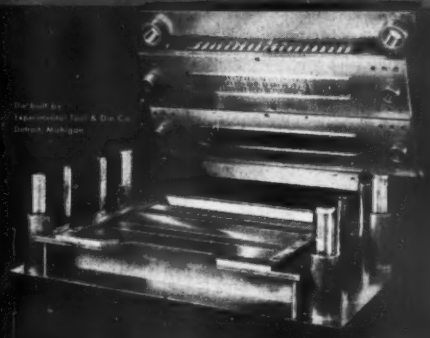

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It should be particularly emphasized here that the physical properties of even the annealed ductile irons are higher than the strongest cast iron. At the same time, the annealed ductile iron having the ferritic structure machined as well as the softest gray (flake graphite) iron also annealed to produce a ferritic structure. The ductile iron, therefore, offers the potentiality of extremely high production rates combined with physical strength of the highest strength gray irons.

The relative machining and physical properties of the ductile and gray irons are compared in Table I. The relative cutting speeds are given here for a constant tool life of 200 cubic inches. Even the as-cast ductile irons appear to ma-

(Continued on page 118)

TABLE I

FLAKE GRAPHITE					NODULAR GRAPHITE			
Material	BHN	UTS psi	% Elong.	Cut Speed FPM	Material	BHN	UTS psi	% Elong.
Acicular	263	59,700	0	150				
				200	2% (As Cast)	265	97,250	2
Fine Pearlite	225	45,000	0	310	4% (As Cast)	215	93,000	4
Coarse Pearlite	195	35,000	0	325				
				420	17% (As Cast)	207	84,700	17.5
				600	20% (Anneal)	183	77,000	20
Ferrite (Anneal)	100	15,700	0	960				
				970	22% (Anneal)	170	70,000	22

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Method X, from page 62

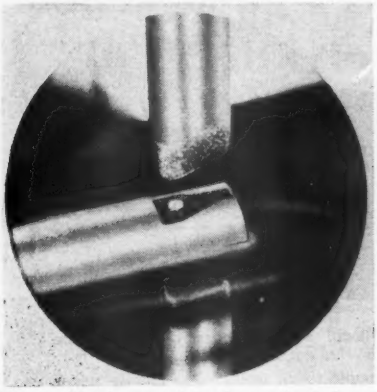

Fig. 3. Metal removal is the mechanical, not thermal, effect of electricity on the material being shaped. Particles detach themselves *without melting*, leaving the exposed surfaces unchanged physically or chemically. The metal removal is accomplished rapidly and accurately.

countered in service. Brazes may fail or wedges may work loose. In either case, failure of expensively fabricated die sections may result.

Metallurgical research experiments and tests require holes or slices cut in superalloys, high temperature carbides and ultra hardened steels without destroying or changing the exposed surfaces either physically or chemically.

The application of Method X to all these problems is the answer. Gas turbine blade contours and root serrations can be readily shaped with this equipment. Hardness has no effect on machinery speed. Sintered carbide die sections can be bored and tapped so that direct fastening to the backing blocks with machine screws can be accomplished. Complicated geometric shapes can be shaped directly into the hardest of metals, as shown in Figures 1, 2 and 3.

The problem of warpage encountered in heat treating steel dies composed of symmetrical hole shapes such as for cookie dies for electrical stator laminations can be eliminated completely by first heat treating the solid steel section, then machining the desired shapes by Method X. Sintered carbides undergo a shrinkage of 15 to 20% which is not uniform in all directions and it is, therefore, impractical to form several hole shapes in the half-sintered carbide and then expect hole centers within close measurements. By utilizing this method, simple geometric shapes can be produced as hardened pieces and then accurate machining of the desired holes can be done rapidly and accurately. Much of the laborious grinding and lapping time usually associated with sectional dies can be eliminated completely. Threaded fastening holes and work sections, no matter how complicated, can be machined in the hardest and toughest of carbides, as illustrated by Figure 4.

Standard Method X Machine is "Universal"

The equivalent of all machining operations ordinarily performed in metalworking, such as boring, drilling, tapping, internal and external shaping and engraving, can be done by using the electrode as a cutting tool. In addition, this machine can perform some machining operations not at all practical even with ordinary machinable materials on conventional machines. For example, see the workpiece in Figure 5. It is a blind triangular shape, open at the apex and has an integral pin located in the center of the triangle. The shape is formed by the use of an electrode made to the shape desired and fed directly into the work-

(Continued on page 74)

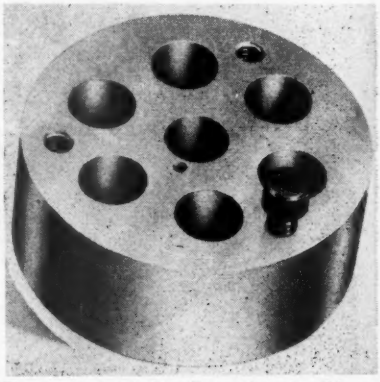

Fig. 4. A compacting die section of solid carbide with three machine-screw holes. The machining was done entirely after final sintering of the carbide.

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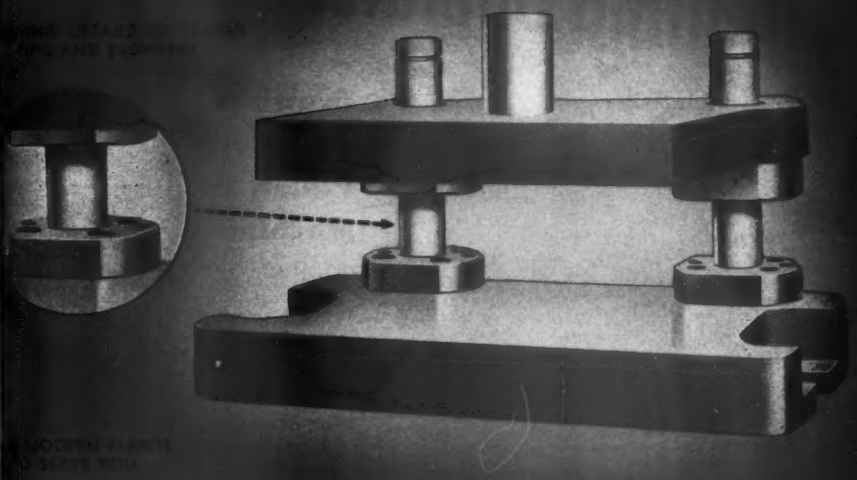

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SEE ADVERTISERS INDEX. PAGE 137. FOR KEY NUMBERS

Good Illumination Increases Engineering Efficiency

There is no doubt that good illumination is of as great importance to the individual engineer as to the efficiency of a plant.

The advantages to industry of good illumination are, according to a report of the Illuminating Engineering Society: greater accuracy of workmanship, resulting in improved quality of the product with less spoilage and less re-work; increase of production, decrease of costs; better utilization of the floor space; greater ease of seeing, particularly among older employees, thus making them more efficient; less eye-strain; improved general morale resulting in decreased labor turnover; cleanliness which is more easily maintained; and greater safety.

Headaches and Glasses

Not only the eyes suffer from poor vision and continuous strain. A tool engineer for several months suffered from headache in the late afternoon which noticeably reduced his efficiency. He looked everywhere for the cause of the trouble: a previous sinus trouble, insufficient hours of sleep, fatigue and exhaustion. Finally an eye doctor found out that he was astigmatic, — the axis of his eyes was sidewards directed. He ordered correct glasses for the tool engineer, and the headaches ceased immediately. Well fitted glasses abolish many complaints caused by vision troubles.

Illumination and Efficiency

The Illuminating Engineering Society has recommended certain minimum standards of illumination for industrial interiors. The figures of their table refer to the general lighting or lighting throughout the total area involved as measured on a horizontal plane 30 inches above the floor.

In this table we find a minimum of 10 foot-candles illumination for structural steel fabrication. For sheet metal works the figures are: miscellaneous machines, ordinary bench work, 20 foot-candles; punches, presses, shears, stamps, spinning, medium bench work, 20 foot-candles—the seeing tasks of this group requiring the recognition of fine detail by using reflected or transmitted light from a luminous area; tin plate inspection with illumination levels, from 50 to 100 foot-candles, and also using reflected light from a luminous area.

The recommended figures in the table for machine work are:

Rough bench and machine work
20 foot-candles

Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing
30 foot-candles

Fine bench and machine work, fine automatic machines, medium grinding, medium buffing and polishing
50-100 foot-candles

Extra fine bench and machine work, grinding—fine work
above 100 foot-candles

The latter two figures means that a combination of general illumination and supplementary lighting at the point of work is necessary. The design and installation of combined illumination must provide sufficient amount of light as well as the proper direction of light diffusion for eye protection. It should eliminate direct and reflected glare as well as objectionable shadows. Where safety goggles are worn, the light reaching the eye is likely to be materially reduced. The general level of lighting should, therefore, be increased accordingly in the work rooms.

For rough drawing and sketching 30 foot-candles are necessary. For prolonged close work, art drafting and designing in detail, 50 foot-candles. For very fine tools and tool inspection an illumination level above 100 foot-candles is needed.

It is interesting to note that the Manual of Industrial Hygiene mentions that consideration is being given to the proposition of issuing a report on recom-

(Continued on page 116)

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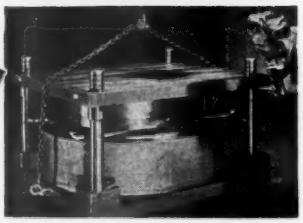
Exclusive Superior "Lock-Jaw" with locking key inserts in slots of Safety Flange . . . ready for any type movement or manipulation.

Exclusive Superior Safety and Lifting Device assures safer and speedier handling of die sets of any size.



Exclusive combination of Safety Flange and Lock-Jaw permits turning die set over without need for clamping . . . physical strength of approximately 135,000 lbs. per sq. in.

SUPERIOR STEEL REPRESENTATIVES

W. H. SCHULZ CO., 2438 Franklin Ave., St. Paul 4, Minn.; MR. G. T. OSBORNE, Box 5906, Indianapolis 5, Ind.; INDUSTRIAL SALES & ENG. CO., 1227 Vassar Dr., Kalamazoo 27, Mich.; THE STANCO CO., 1914 Canton St., Dallas 1, Texas; MR. W. H. SOWARD, 720 Superior Ave., Dayton 7, Ohio; STOREY TOOL SALES CO., 801 Gas-Electric Bldg., Rockford, Ill.; LEE HORNEVER CO., 7 No. Grand Blvd., St. Louis 3, Mo.; MR. ANDDREW C. GRAHAM, 2904 Wilson Ave., Chicago 25, Ill.; MR. R. R. STAMM, 2754 So. 19th St., Milwaukee 7, Wis.

SUPERIOR STEEL PRODUCTS CORP.
2754 South 19th St., Milwaukee 7, Wisconsin

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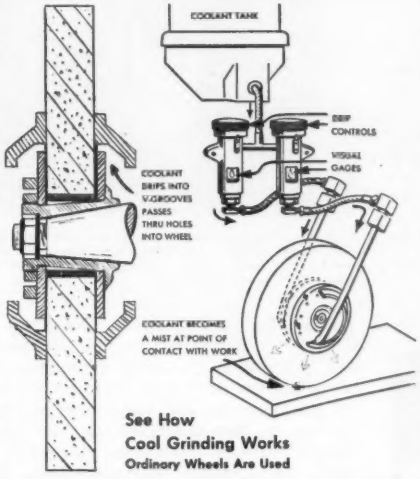
DoALL "COOL GRINDING"

U. S. Patent No. 2470350

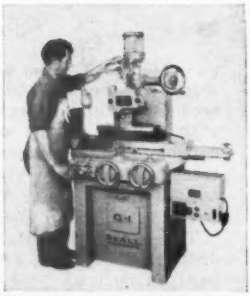
COOLS THE CUT AND THE WORK • NO BURNING OR CHECKING
FASTER GRINDING • GREATER ACCURACY • LONGER WHEEL LIFE
FULL VISIBILITY • NO SPLASH GUARDS • NO MESSY TANK OR PUMPS

HOW IT WORKS

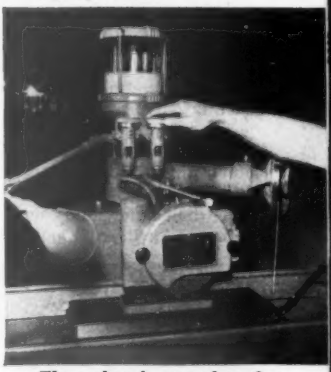

COOLANT TANK
DRIP CONTROLS
VISUAL GAGES
COOLANT DRIPS INTO V-GROOVES PASSES THRU HOLES INTO WHEEL
COOLANT BECOMES A MIST AT POINT OF CONTACT WITH WORK

See How Cool Grinding Works
Ordinary Wheels Are Used

IN DoALL "COOL GRINDING" coolant flows *through* the wheel and atomizes at the point of work. Every cutting particle is surrounded by coolant. *Standard wheels are used.* The results are spectacular. Big time and labor savings, greater precision, longer life between tool grinds are just a few of the benefits. There is a complete line of DoALL Precision Grinders with "COOL GRINDING" for every toolroom and production job. Ask to have a DEMONSTRATION of one of these grinders in your own plant.



There is a DoALL Precision Grinder for every surface grinding requirement.



The coolant is metered to flow into and through the wheel.

SEND FOR CATALOG
Tells all about the benefits of "COOL GRINDING," shows DoALL Precision Grinders for every requirement.

DoALL

27 SALES-SERVICE STORES

GE-35

THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

. . . Method X, from page 66

piece by the Method X machine. A second finishing operation is performed with the use of the same electrode by cutting off the eroded end of the electrode and making necessary electrical adjustments and re-entering the electrode in the rough shaped hole.

The machine's design is similar to a drill press, Figure 6, with a pedestal type base, an electrode feed and control mechanism, and a remote unit power supply. The machine has a work table provided for longitudinal, lateral and vertical traverse and full rotation for work alignment. Electrode feed is automatically controlled by an Amplidyne and associated circuits so that optimum cutting speeds for a given cutting condition are maintained. The power supply is fed from 220 volt, 60 cycle, single-phase lines. The peak demand under the most severe cutting conditions does not exceed 7 kilowatts.

A dielectric fluid such as fuel oil, kerosene or a compound especially developed for this purpose, Dielectro X, is used to enclose the cutting operation. The purpose of the work submersion in the Dielectro fluid is to build up electrical resistance so that the energy storage devices in the machine may be fully charged prior to discharge. Secondly, to flush the loosened particles from the work area. No fluid is lost except through evaporation or carry-off on the fabricated parts.

Fig. 5. The Method X machine performs all machining operations ordinarily accomplished in metalworking, such as boring, drilling, tapping, internal and external shaping and engraving. An electrode, negative of the shape to be produced, is fed directly into the material. The loosened particles are carried away from the work area by a dielectric fluid in which the machining operation takes place. The machine operates from a remote power supply fed from a 220 volt, 60 cycle, single-phase line. Peak power demand does not exceed 7 kilowatts.

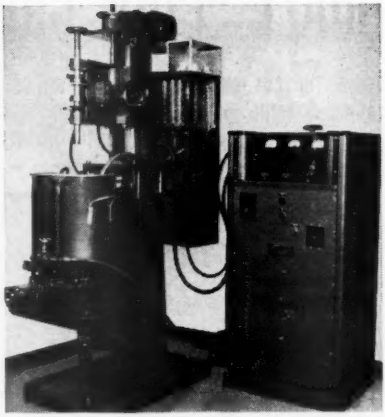


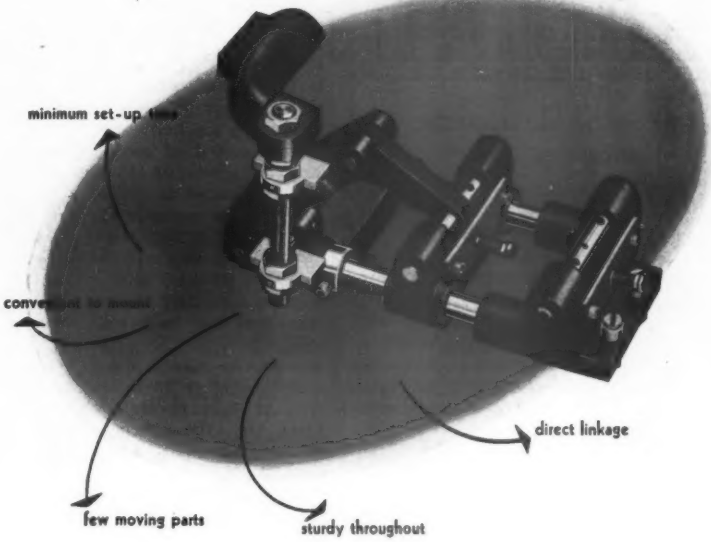
Fig. 6. The machine is designed similar to a drill press with a pedestal type base, an electrode feed and control mechanism, and a remote unit power supply.

Electrodes are made of a highly conductive, easily machined material, such as brass, although other conducting materials may be used. They are usually machined to a negative of the shape to be produced when the machining operation can be performed with the head moving in a vertical direction. When the machine is required to revolve, or the work table traverse, for an internal, irregular contour such as illustrated in Figure 5, an electrode of brass wire bent to the necessary working angle is all that is required since the tool does not make physical contact with the work.

All secrecy restrictions imposed by the Government in the interest of national defense have been rescinded and the Method X Company is permitted to furnish all the essential information concerning the use of the process.

new automatic **SUREFEED**

improves press performance



After experimenting with a variety of automatic press feed designs, Producto now presents the new, field tested, Surefeed. Set-up time has been cut, feed maintenance troubles minimized because of simpler design and fewer moving parts.

Producto Surefeed is quickly and easily mounted on the die set . . . both can be handled as a single unit. Set-up and adjustment is very simple. It has no actuating springs, cams or other intricate parts . . . linkage is direct and positive. A high degree of accuracy is inherent in this direct feed . . . but pilots or other positioning devices may be used when exact stock register is essential.

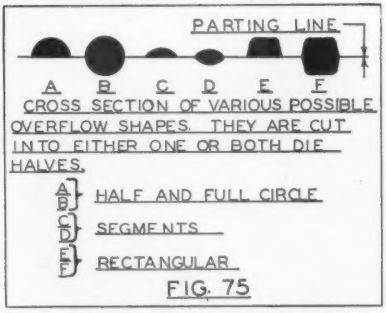
Write today for Surefeed bulletin. See how the Surefeed can improve your press department schedules.

THE PRODUCTO MACHINE CO.

970 HOUSATONIC AVENUE • • BRIDGEPORT 1, CONNECTICUT

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Die Casting Die, from page 53


PARTING LINE
A B C D E F
CROSS SECTION OF VARIOUS POSSIBLE OVERFLOW SHAPES. THEY ARE CUT INTO EITHER ONE OR BOTH DIE HALVES.
A B HALF AND FULL CIRCLE
C D SEGMENTS
E F RECTANGULAR
FIG. 75

this reason it is best to ascertain if their presence is necessary before the die is hardened. Machining the overflows as against grinding them in, especially with high speed air grinders, is preferable in that their dimensioning, and in particular their channel connection with the main die cavity, can be held to closer dimensional tolerances. This is a prerequisite as we shall see later to the proper functioning of the overflow when employed for certain applications.

The shape of overflows that have been machined-in will of course depend upon the contour of the cutting tool; however, the least desirable cross-sectional area of an overflow (taken perpendicular to the plane of die parting) is the hemisphere, or sphere, because for any given mass of molten metal, these represent the minimum external area of molten alloy exposed to the steel die blocks, as shown in Figures 74-A and 75-A and B.

Actually a rectangular cross-section is much preferable so long as its sides have sufficient draft to permit the easy ejection of the overflow from the die face, as indicated in Figures 74-F and 75-E and F.

An overflow that is employed to heat a certain spot within the die should be designed so that it can give up the maximum amount of heat to the steel of the die in the shortest interval of time.

Figure 75 illustrates several types of overflow cross-sections. Note than an overflow may be so designed as to lie only in one die half or in both die halves. When it is located in only one die half, it will add more heat to the die half in which it is situated due to the greater surface area of connect with that die half. It must also be noted that if the overflow is located only in the stationary die half, it will give up heat to the colder die steel only so long as it is in contact with the die steel, and that such contact is terminated when the die opens and the overflow is pulled away from the stationary die half.

This period of contact, during which heat is given up to the die steel is slightly longer in the case of overflows cut into the movable die half since this period is not terminated until the die casting and its overflows are ejected.

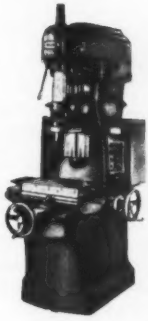
On the whole, if an overflow is to function as a heating element, it will be cut into that die half which needs added heat. Because the principal reason for wanting to heat a die is to promote a smooth surface finish on the die casting, free of cold sheets, cold flow marks, lines, etc., the overflow is usually cut into that die half which forms the important surface on the die casting. Where a good finish is required all over the die casting, the overflow, if needed, is cut into both die halves.

If the reason for employing an overflow is to collect entrapped air, it does not matter too much from a functional standpoint into which die half the overflow is cut; therefore, it is usually cut into the movable die half because its presence in this half has certain advantages over its being located in the stationary die half such as: (a) the fact that the overflow will tend to free itself of the stationary die half easily during the opening and closing of the die and (2) the fact that if it does stick on the die face, it is more easily freed from the movable die half by means of the ejection system which functions in this die half.

Mention must be made here of the fact that if an overflow is to be located in both die halves rather than just one half, as illustrated in Figure 75, it is necessary to perform a machining operation on both die halves rather than on just one half, which requires nearly twice the machining time.

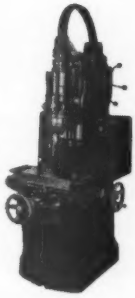
(Continued on page 84)

NOW IS THE TIME TO PLAN AHEAD

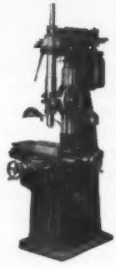


No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

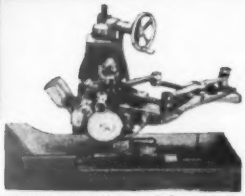
No. 2 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from ¼" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.



No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Chrome Carbide
A New Man-made Metal

An entirely new tungsten-and cobalt-free family of metallic carbides, to be known as Series 600, having physical properties better in many respects than conventional tungsten carbides is now in the limited pilot plant stage and expansion is underway for full production by the Carboloy Department of General Electric Company.

The new carbide, produced from powdered metals, contains approximately 70% by weight of chromium and is thus primarily a "chrome-carbide." Field tests on several applications have been completed. Due to its striking physical properties, its introduction opens up many new fields of application for metallic carbides. It eliminates costly and strategic tungsten and cobalt.

Outstanding properties of Series 600 carbides include extremely high resistance to abrasion, erosion and corrosion; lighter weight; a coefficient of thermal expansion the same as that of steels; and extreme resistance to oxidation even at high temperatures. It is completely non-magnetic.

Although the new material may find some applications where tungsten carbides are used at present, it is not expected to supplant the latter since the outstanding properties of Series 600 supplement rather than 'compete' with conventional tungsten carbides.

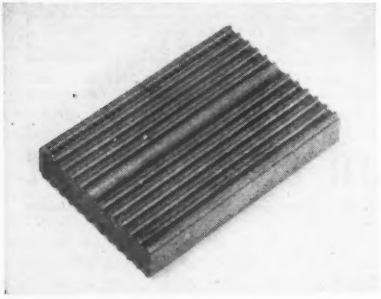


Fig. 1. Gage anvils currently being made of Series 600 chrome carbide. In the gage field (gage blocks, ring gages, plug gages, gage anvils) the material has demonstrated outstanding ability to resist corrosion and abrasion. Since its coefficient of expansion is about the same as that of steels, readings are not affected by temperature variations.

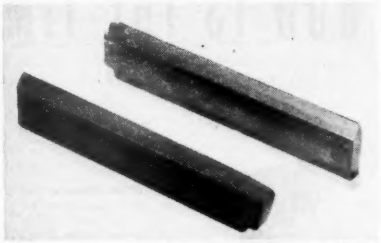


Fig. 2. An even higher resistance to combined erosion, corrosion and abrasion than tungsten carbides is demonstrated by these centrifuge blades. Both were run for six weeks. The tungsten carbide blade is at the front, the Series 600 chrome carbide blade at the rear. Life of steel blades is very much shorter than either, of course.

In the gage field, Series 600 is currently being used in pilot quantities for the production of gage blocks, ring gages, plug gages, and gage anvils. In this latter application, Figure 1, its success is due to its ability to resist both abrasion and corrosion plus the fact that, having about the same coefficient of expansion as steels, gaging results are not affected by air temperature variations (no correction charts need be used). Its lighter weight than tungsten carbides increases ease of handling and facilitates the use of solid carbide.

In valves used in the petroleum industry (chrome carbide balls used in combination with Grade 55A tungsten carbide valve seats), Series 600's outstanding performance is traceable to a combination of lighter weight (less pounding) than tungsten carbide balls; and its greater ability to resist abrasion, corrosion and particularly erosion.

The combination of erosion, corrosion and abrasion resistance also accounts for the successful application in centrifuge blades. Shown in Figure 2 are two carbide blades after running for six weeks

(Continued on page 82)

New . . .
DuraCut Abrasive Discs

Blending weld on stainless steel tank.

Smoothing weld bead.

IF YOU'RE LOOKING for a BETTER WAY . . .

. . . to blend welds and similar jobs, at a lower cost with greater productivity, investigate the vast possibilities of DuraCut Abrasive Discs. These new multiple layer abrasive discs, are *flexible, strong, safe,* offering many advantages over the ordinary single layer type of coated discs.

- MAXIMUM FREEDOM OF CHIP DISPOSAL (segment patterned)
- INCREASED LABOR SAVINGS (less disc changing)
- FASTER, SUSTAINED RATE OF CUT (built to grinding wheel specifications)
- 10-25 TIMES LONGER LIFE (over 1/4 million more cutting particles)
- WITHSTAND LONG CONTINUED FLEXING (extra matted reinforcing)

Removing rust and scale.

Removing weld spatters.

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Order Today for a Trial.

Sizes available for immediate shipment
7 x 1/8 x 7/8 } In any of these
9 x 1/8 x 7/8 } grit sizes: 36, 54, 80

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TUMICO SNAP GAGES

Fast, Accurate

PRODUCTION LINE CHECKING

Larger sizes have rigid tubular steel frames which are 25 to 50% lighter than solid steel. Faster and easier to use. Physical fatigue is reduced and accuracy of measurement maintained. Smaller sizes 0 to 6" are of solid steel construction. American gage design standards strictly adhered to. Write for catalog of models, sizes. Special gages made to user's specifications.

TUBULAR MICROMETER CO.

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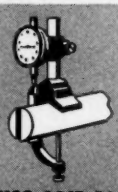
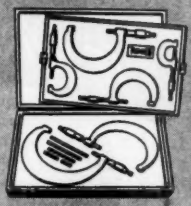
FOR EVERY JOB

TUMICO

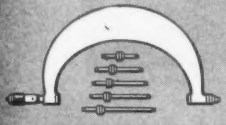
PRECISION MEASURING INSTRUMENTS



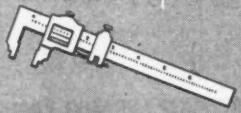
TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".



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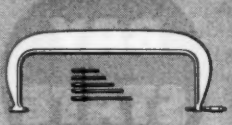
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".



TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

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WHAT THE EVOLUTION OF WALES HOLE PUNCHING & NOTCHING EQUIPMENT *means to* YOU!

● The evolution of this equipment not only provides the most complete line of STANDARD hole punching and notching equipment in America, but has revolutionized tooling practice by *astoundingly reducing tooling costs and time.*

Before the availability of Wales Equipment, it was necessary to design and custom-build a completely new "fixed" die for each pattern with special punches and punch plates, special stripper plates, special die buttons and die plates. NOW . . . a group of Wales independent, self-contained Units may be set up in unlimited patterns and put into operation the same day a pattern is released for production. Setting up Wales Equipment is a simple assembly operation. *No aligning of punches and dies.*

After a pattern has been run, the same group of Wales Units may be used and reused in other patterns on stamping presses and press brakes eliminating "dead storage" of set-ups and tooling investments by keeping them in practically continuous operation.

There's always something new in the Wales Line, so write TODAY for your copies of fully-illustrated, functionally-colored Wales Catalogs.

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GEORGE F. WALES, *Chairman*

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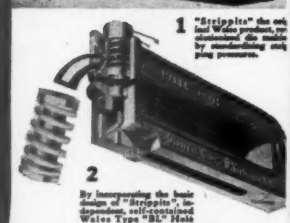
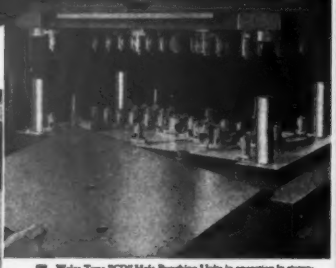
Specialists in Punching and Notching Equipment



1 "Strippit" the original Wales product, revolutionized die making by standardizing punching pressures.

2 By incorporating the basic design of "Strippit", independent, self-contained Wales Type "BL" Hole Punching Units become a reality.



5 Wales Type "CD" Hole Punching Units in operation in stamping press for punching mild steel up to ½" thick.

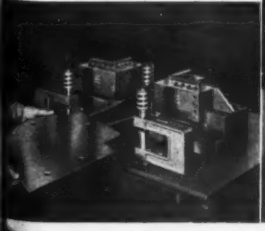
Wale Notching Units were a natural outgrowth of the successful applications of Wales Hole Punching Equipment on basic principle of Wales "Strippits".

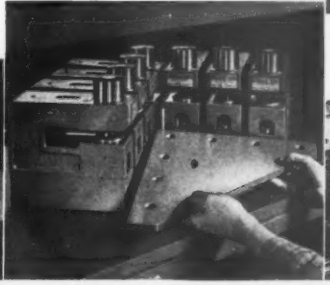
4 Above is a combination set-up of Wales Type "BL" Hole Punching Units and Type "N" Notching Units for punching mild steel up to ¼" thick. Note the punched and notched work in foreground.

8 Wales Type "E" Hole Punching Units for punching angles, channels and extrusions up to ½" thick. Shearing 3 press brakes in line punching holes in stringers up to 40 feet long.

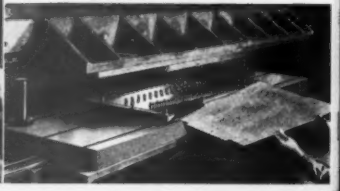
7 Wales Type "G" Hole Punching Units for punching mild steel up to ½" thick.

A combination set-up of Wales Type "NJ" Notching and Type "CJ" Hole Punching Units punching and notching mild steel up to ¼" thick.





9 Wales Multiple Hole Punching System for simple, fast, convenient and economical punching sheet metal parts up to ½" thick mild steel.



. . . Chrome Carbide, from page 78

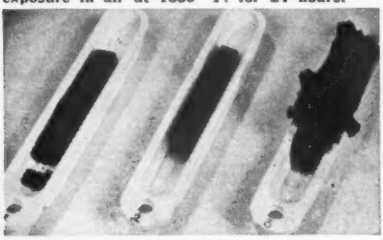
under severe conditions. The worn blade (in front) is of tungsten carbide, previously considered the outstanding material for this type of application. The blade at the rear is of Series 600 chrome carbide. Life of steel blades is very much shorter than either, of course.

Properties Analyzed

Corrosion. A considerable number of comparative corrosion tests have been conducted on Series 600. Typical are the salt-spray tests carried on at Battelle Memorial Institute. After subjecting Series 600 to a 30% salt-spray for 750 hours, the test samples still retained their metallic lustre, so little had they been affected. With sulphuric acid as corrosive agent, Series 600 showed about 30 times the resistance of 18-8 stainless and 3 times the resistance of conventional carbides. Using nitric acid, the resistance to corrosion was approximately 8 times that of other carbides, twice that of stainless steels. Series 600, it was found, was practically inert under all conditions when exposed to citric or lactic acid, thus indicating an excellent field for the material in food processing machinery.

Oxidation and erosion. Series 600 chrome carbide appears to be virtually completely resistant to oxidation at all temperatures up to 1000° C. (1832° F.). When subjected to a temperature of 1850° F. for 24 hours, the samples, Figure 3, still maintained their lustre, while simultaneously exposed samples of stainless steel and tungsten carbides had completely disintegrated. Favorable results also have been obtained in other tests conducted at temperatures over 2000° F.

Fig. 3. Among the outstanding properties of Series 600 chrome carbide is its resistance to high temperature oxidation. Shown here are samples (left to right) of 18-8 stainless, Series 600 chrome carbide and tungsten carbide—all originally of identical shape and size—after exposure in air at 1850° F. for 24 hours.



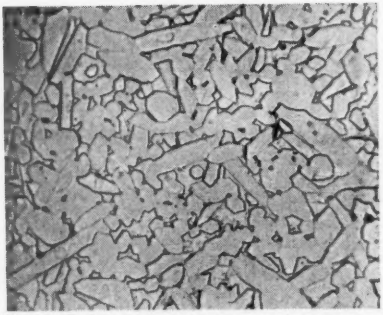


Fig. 4. Series 600 presents a microstructure entirely new to the metal field. Particularly notable are uniformity of grain size and structure and the interlocking character of the grain structure. Magnification of this illustration is 750 diameters.

Erosion tests conducted with steam indicated a resistance to steam erosion approximately 50 times that of conventional carbides.

Magnetic Properties. Appear to be completely non-magnetic.

Coefficient of Expansion. Approximately same as steels, where conventional carbides have a considerably different thermal expansion rate than steels.

Machinability. About the same as tungsten carbides. Series 600 apparently has ample toughness to permit grinding without chipping or cracking.

Stability. Parts of Series 600 produced to date appear to be completely stable, with no internal strains.

Hardness. Much higher than steels. Approximately same as tungsten carbides at room temperatures (approximately 80-93 Rockwell A).

Strength. Compressive strength far higher than most steels.

Microstructure. As shown in Figure 4, the microstructure of Series 600 chrome carbide presents an appearance entirely unlike that of any other metal. Particularly notable is the uniformity and the interlocking character of the grain structure.

(Continued on page 86)

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Die Casting Die, from page 76

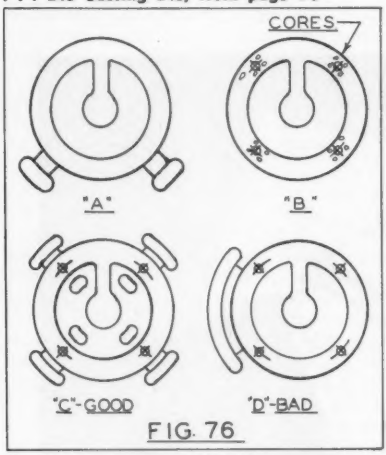


FIG. 76

Types of Overflows

As we have indicated, overflows may be of various sizes and shapes, and they may be at various locations on the die faces. In addition, they may also be employed in several different locations and for one or more of their possible functions all in the same die.

If, let us suppose, it is necessary to add heat to the periphery of a ring-type die casting, which is center-gated, as shown in Figure 76, use may be made of one or perhaps two overflows that are shaped to the contour of the die casting. However, if porosity is present around the periphery near the areas where there are stationary cores, Figure 76-B, and must be eliminated then one overflow or even two will not suffice. In this latter instance, several overflows may have to be resorted to as shown in Figure 76-C. If only one overflow were used, it might very probably fill up completely with metal entering it at one point before air still entrapped in the main die cavity had time to be forced into it, Figure 76-D. Thus, while some entrapped air might be forced out of the main die cavity into one end of the overflow, air entrapped further along in the main die cavity might not be forced into the overflow because the overflow filled up before the entrapped air at this latter point could be forced into it, or because the channel leading to the overflow became sealed off by frozen metal before the overflow had a chance to function.

If a section of a die casting is host to entrapped air all along its length, it is best to use several separate overflows rather than just one overflow, as illustrated at Figure 77.

If a series of overflows close together are felt to be necessary, it is best to design these, if at all possible, as shown in Figure 78-A, for the design of Figure 78-B reduces the width of the runner feed and consequently tends to localize the area of the die casting proper from which the molten alloy and entrapped air are drawn off.

Overflows on Movable Cores

Overflows can be located anywhere that space will permit and where their presence will not prevent the ejection of the die casting proper or the overflow itself. Generally, overflows are cut into the face of either the stationary or movable die half; occasionally however, overflow cavities are cut into the ends of movable cores, indicated in Figure 79.

(Continued next month)

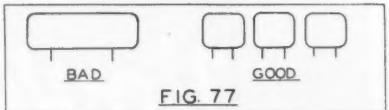


FIG. 77

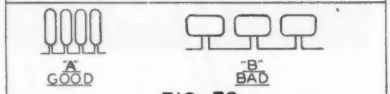


FIG. 78

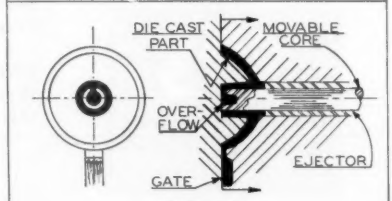
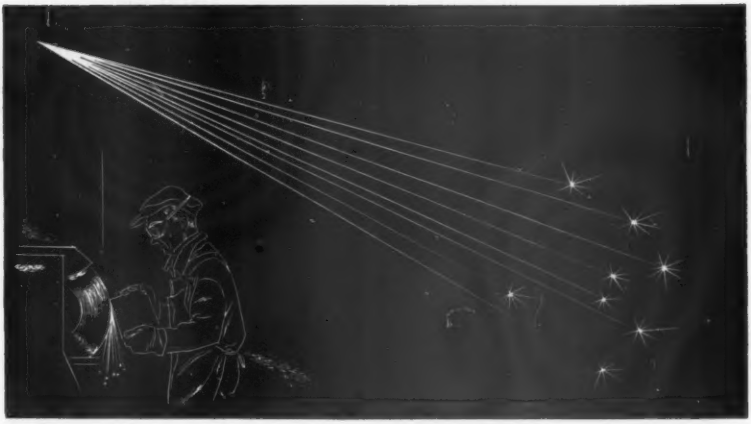


FIG. 79



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. . . Chrome Carbide, from page 82

Method of Use

In general, Series 600 chrome carbide will be available at the outset in the complete size and shape range in which tungsten carbides are currently offered. There are apparently no inherent physical limitations as to size and shape eventually producible, however. Chief current limit is the availability of processing equipment for larger sizes. Installation of equipment for larger sizes will be dependent of course on market demand.

Series 600 is expected to lead to the making of complete parts of chrome carbide rather than tipping as with tungsten carbide. Series 600 can be brazed, and may also be attached by mechanical means. It lends itself well to attachment by means of thermo-setting resin cements where use of such cements is feasible.

★ ★ ★

PEI Urges Conversion of Enameling Furnaces for Defense Heat Treating

As a result of reports that the demand for industrial furnaces during the first half of 1951 was five times as great as during the same period last year, the Government Committee of the Porcelain Enamel Institute has again called attention to the possibility of converting porcelain enameling furnaces to defense heat treating applications.

According to PEI, the delivery time for new industrial furnaces has been greatly extended as a result of the increased demand, material shortages and manpower problems, so that there is an imperative need for additional furnaces to take care of growing defense needs. Because of the shortage of cobalt and other materials used in porcelain enameling, a part of the enameling furnaces in the porcelain enameling industry now are available for prime and subcontract work involving heat treating of aluminum and steel.

Reciprocating Formed Tool Used on Gear Chamfering Machine

Removing tooth burrs from a wide variety of gears is accomplished by the new Burr-Master developed by the Modern Industrial Engineering Co. Two of the many advantages built into this machine are the high production speeds and simplicity of operation.

It incorporates a reciprocating form tool mechanism which will cut from 3 to 20 teeth per second, depending upon the tooth pitch. The tool generates a finished cut around the tooth contour. Either single or double cutting faced tools may be used.

With the double faced dovetail tools, chamfering or deburring can be performed on the inside faces of alternate third or fourth teeth.

The two-station burring machine

shown in the illustration is set up to chamfer teeth on a drive shaft ring gear. The gear is located on the first spindle and cycles automatically through the burring operation. It is then moved to the second spindle where the other end is chamfered. Indexing of the gear takes place during the return stroke of the tool and the machine is designed so that no clamping is required.

For complete information, write MODERN INDUSTRIAL ENGINEERING CO., 14230 Birwood Ave., Detroit, Mich.

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PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Gears and Stampings, from page 49

Fig. 4. Part of a row of seven Roto-Finish barrels used by Ford to deburr stampings. Pans handled by an electric hoist charge Coruloy chips that do the deburring.

rels and the chips stored in bins according to their size.

There are seven No. DW-45-2, two-compartment barrels in the line used for stampings. The stampings are delivered at one end of the line located adjacent to the stamping department and are delivered from the opposite end after processing. One man tends the barrels in this group besides handling the parts and chips described above. Barrels have timers that are set to stop the barrel at the end of the run. All barrels have hinged screens that have to be lowered, as a safety measure, except when inching the barrel to loading and unloading position.

All steel parts other than stampings, that require deburring or descaling, are of the type shown in Figure 2 or are similar as to finish, are handled in another row of four barrels, Figure 5. This line is adjacent to the heat-treating department. For descaling, the average charge per barrel compartment is 250 lb of work pieces, 1000 lb of Coruloy chips of Nos. 3, 4 or 5 size, 3 lb of No. 117 Roto-Finish compound and 12 gal of water which is enough to cover the charge.

This load is run ½ hr at 20 rpm after which the compound is flushed out with water. Then 3 lb. of 117A Roto-Finish compound is added for a 15 min run at the same speed. The first compound contains an acid that aids in scale removal and the second compound neutralizes the acid. Chips remain unchanged. The largest size that will do the job and not stick in work pieces is the one chosen. Parts that have rusted can be cleaned by the same treatment.

Pump gears shown in Figure 2, stepped cylindrical steel valves, and most other parts deburred in the equipment shown in Figure 5, are precision machined. In this respect, as well as in section thickness, they differ from stampings and require different hand-

(Continued on page 90)

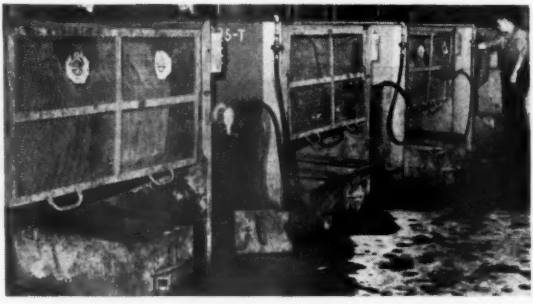

Fig. 5. In these four barrels, gears and other parts like those shown in Figure 2 are deburred and descaled. All barrels have protective screens to promote safety.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Gears and Stampings, from page 88

Fig. 6. Unloading precision parts after deburring. The cage fastened to the barrel opening keeps parts from falling and thus avoids damaging impacts. Chips fall into the pan below the cage.

ling. Deburring is done in the same way but at slower barrel speeds and more care in handling is required to avoid marring.

Gears, which are SAE 1137 or 1146 cold drawn steel, are processed in lots of 120 to 400 pieces per load but, before they are loaded in the barrel, 1000 lb of Coruloy chips (No. 3, 4 or 5 size) 3 lb. of No. 11 Roto-Finish compound and 12 to 17 gal of water are put in each compartment. This mixture is tumbled 10 min before any work pieces are added. Gears are then put in one at a time by hand on top of the chips and are set 2½ to 6 inches apart, center to center.

When the space on top of the chips is thus loaded, the barrel is inched around three revolutions to submerge the gears in the wet chip mass. Then another layer is loaded in the same way, and the barrel is turned three more revolutions. This operation is repeated until the full charge is in place. This procedure is followed to avoid possible nicking of gears by impacts before they are in the mass. After they are in the mass, the sloshing action is too mild to cause nicking, yet the abrasives do remove burrs as desired.

It requires 2 to 2½ hrs. of barrel rotation at 10 rpm, however, to effect proper deburring of gears. At the end of this period, the compartments are flushed out and an unloading cage, shown in Figure 6, is applied to a compartment opening after its cover is removed. The barrel is then inched around until the cage fills. This cage catches parts but lets most of the chips fall through. Parts do not fall but slide in with the chip mass without the nicking that must be avoided. Parts are then taken from the cage by hand and are placed individually in compartments of wire trays.

Actually, the cage is an expedient devised by Ford personnel to avoid the slow and awkward job of reaching into the barrel for each part. The load cannot be dumped onto a screen without danger of nicking parts but the cage prevents any damaging impacts and greatly expedites unloading. Parts come out slowly and, as they are removed, any remaining chips fall through the cage into a pan. After screening the chips are ready for reuse.

Parts laid in wire trays are hosed off and then are dipped in a hot solution containing one part Actusol to 25 parts of water. After draining, they are again dipped, this time in Rust-Veto No. 377, and are allowed to drain. They are then placed in carrier trays for transfer to inspection and thence to assembly or temporary storage.

Among parts processed in the barrels, Figure 6, are some of a sleeve-like shape that serve as bearing races. These have to undergo two stages of heat-treatment and, after Roto-Finish treatment, have a characteristic finish that is different from that produced by grit blasting.

(Continued on page 92)

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On three operations in the set-up pictured here—machining nickel-moly steel (4615) at 135 to 150 s.f.m.—the superintendent kept careful records of tool performance. It was found that MO-MAX COBALT High Speed Ground Tool Bits ran *43% to 100% longer* that the tool bits previously used. ◈ In the break-down operation MO-MAX ran 4 hours, as compared with 2 hours for the other steel. In facing, it was 5 hours against 3½ hours. In cut-off, 4 against 2½. ◈ This is one of hundreds of tests in which both MO-MAX and MO-MAX COBALT Tool Bits have demonstrated their superiority. So if *you* have a difficult machining problem, a *Cleveland* Service Representative will be glad to give helpful suggestions. Contact our nearest Stockroom, or . . .

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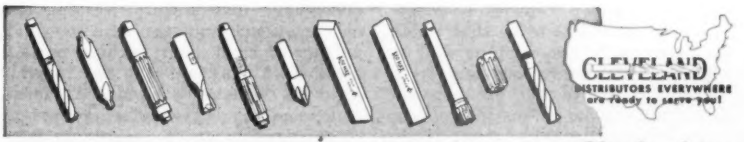


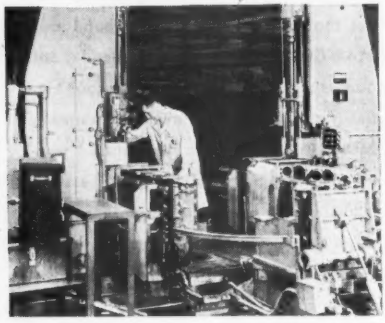
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Honing Generates Alignment in Main Bearings

The accompanying photograph, taken in one of the major automobile manufacturing plants, shows the equipment for honing the main bearing in V-8 cylinder blocks at the rate of over 60 blocks per hour, with all bearings within .0002" for alignment, and to .0005" total tolerance for alignment, size, roundness and straightness. The operation is entirely automatic. The two columns of the machine are set facing each other in the conveyor line. The blocks are taken from the line, automatically tipped up on end and transferred to the fixture of either column. Automatic MICRO-SIZE controls the honing cycle for each block and indicates which column is to receive the block from the line. As the block is finished, it is indexed onto a tilting table and back to the conveyor line.

Photo courtesy Micromatic Hone Corp.



Alignment is generated by a special guided tool. The tool has one bank of abrasives and seven banks of plastic guides. The same abrasives stroke through all the bearings, assuring that they are honed to a uniform size. The guides are spaced so they stabilize the tool as the abrasives pass from bearing to bearing. The guides are forced out radially by the same cone (wedge) that applies pressures to the abrasives.

The operator tends both machines, spot checking the bearings with an air gage. This gage has a single mandrel with five air orifices. All five bearings are gaged simultaneously.

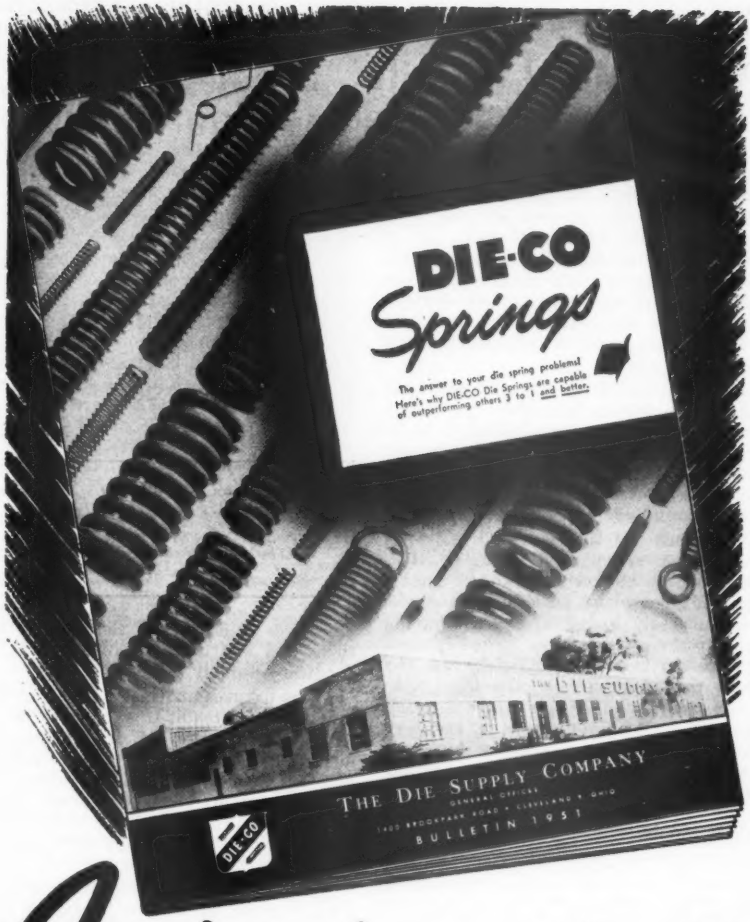
★ ★ ★ ★ ★ ★

. . . Gears and Stampings, from page 90

Use is made of this difference in appearance to help identify the parts as to the stage of processing. Before one stage of heat-treatment the parts are Roto-Finished and before the second they are grit blasted. This helps heat-treating personnel to determine at a glance which batches are to receive both and which only the second stage of treatment. Parts of this type are handled much like gears undergoing deburring but time in the barrel is 60 min.

In all deburring by Roto-Finish methods, the processing has to be that which fits the part and its condition as well as the conditions that the processing is to attain. On valves, which are stepped cylinders that are centerless ground for final machining, burrs are fine. They must be removed but, in so doing, shoulders at steps must remain square. The edges cannot be rounded. In such work, the media used is the same as for gears (which have heavier burrs and in which some edge rounding is not detrimental) but time is reduced in some cases to only 10 min and speeds of 6 to 8 rpm are used.

Once the correct processing needed is determined, it is always followed on succeeding batches of identical parts in the same initial condition. This insures dependable and uniform results. Such deburring not only avoids a very large amount of hand labor, because parts are handled in bulk (except for individual handling sometimes needed in loading and unloading barrels) but it eliminates the uncertainties and variations that, in hand deburring, are unavoidable.



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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

A New Metal Permits Ideal Gaging Conditions

by **E. Vanko**
Research & Development Dept.
Gage Division
The Pipe Machinery Company
Cleveland, Ohio

For inspecting male threaded parts, the solid thread ring gage represents the only method that simulates actual assembly conditions, i.e., the fit of a component into a threaded hole.

The solid steel ring, however, is handicapped by quite rapid wear which destroys its built-in accuracy and shortens its economic life. When its accuracy is gone, product protection, quality-wise, is also gone.

The present AGD adjustable thread ring gage, which for many years has been the standard for industry, is at best a compromise design and does not truly duplicate product assembly conditions. What is gained in wear life is lost in accuracy.

Inasmuch as the threaded holes in components are not "adjustable," it is too much to expect that an adjustable gage, a gage whose basic characteristics are purposely variable, a gage having take-up slots which make thread engagement often extremely difficult, can any more than approximate the ideal. As wear occurs and as the gage is reset, more of its originally built-in accuracy is destroyed. Further, because the resetting of an adjustable thread ring depends upon the widely varying human sense of "feel," there can be the question as to whether the gage is properly reset. Settling this question involves "time out" because the gage must be taken away from the job.

Through the years, efforts have been made to devise thread inspection equipment which would eliminate the objectionable features of the AGD compromise design. Because no techniques had been developed to produce small diameter, internal threads in the longer wearing materials, designers were led away from truly functional thread inspection objectives and toward complicated fixtures and instruments which do not reproduce assembly conditions.

These fixtures and instruments are admittedly an attempt to overcome the objectionable features of the compromise adjustable thread ring. All are adjustable in themselves and are, therefore, subject to errors of use and abuse as are all gages which incorporate adjustments or variables for offsetting wear or for increasing working range.

A long step forward was accomplished several years ago when The Pipe Machinery Company succeeded in developing a technique for generating threads in hard, long-wearing materials. This technique, in combination now with a new material, has made possible the return to the only basic and technically correct method of inspecting male threads.

The new material is a titanium carbide combination known as "Demark".* It is very light in weight (a very important factor in the manipulation and sensitivity of hand-held gages), it has

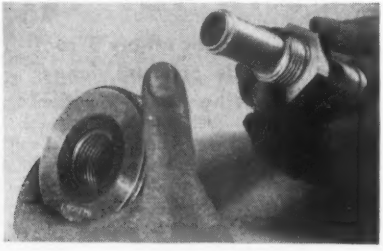


Fig. 1. The extreme over-all light weight of the "Demark" metal solid thread ring gage is accounted for by the lightness of the gage proper and the aluminum holder in which it is mounted. A serial number is engraved on the polished aluminum surface of the holder, and the wear check plug for each thread ring carries the same serial number. Thus, the gage manufacturer maintains a permanent record of the elements of all gages: lead, angles, diameters and hardness.

*The trade name "Demark" is the exclusive property of The Pipe Machinery Company for gage use.

Fig. 2. The non-adjustable thread ring gage, by virtue of incorporating no variables, is as foolproof as it is possible for a precision gage to be. It gives the parts manufacturer the full benefit of his total product tolerance. The "no measurable wear"—life of Demark gages means that fewer gages are needed, and that no spares are required as i sthe case when adjustable gages are taken from the job for resetting.

shown phenomenal wear life, and it is far less brittle than some of the cast and sintered metals ordinarily used for wear resistance.

Demark's exceptionally long wear life has eliminated entirely the need for building "wear allowance" into the gage. When gages are made of relatively fast wearing materials, a certain value is added, dimensionally, to the basic size.

This amount that is added can come from only one place, i.e., product tolerance. This means that before the gage wears any, and while the gage is wearing, the manufacturer is, of necessity, "cheated" of some of his product tolerance; hence, unfair rejects giving a costly picture of quality level.

Further, relative to gages which are subject to wear, they unfortunately do not wear uniformly. Plugs wear tapered, rings wear bell-mouthed, and both wear unevenly on thread flanks. These factors all detract progressively from the original accuracy of the gage.

With Demark titanium carbide gages it is not only unnecessary to provide wear allowance, but because of the extreme accuracy to which these solid thread rings are held on lead and angle, a much greater percentage of the product tolerance is made available for manufacture.

Because they are manufactured to such a high degree of accuracy, it is necessary to provide a special wear check plug with each ring. Throughout their development program many of these rings have been placed in industry and subjected to the most severe usage in 100% inspection setups, and, when called back in, they have been found in a state of "no measurable wear."

This explains why the standard master setting plug even though to "W" tolerances is not close enough to check such super accurate rings. The special check plug that is furnished is of the double-end type, with one end made slightly larger to detect any possible wear. It has been experienced that these rings need never be taken away from the inspection or assembly lines; an occasional test with the high limit wear check plug is sufficient.

★ ★ ★

World's Largest Presses

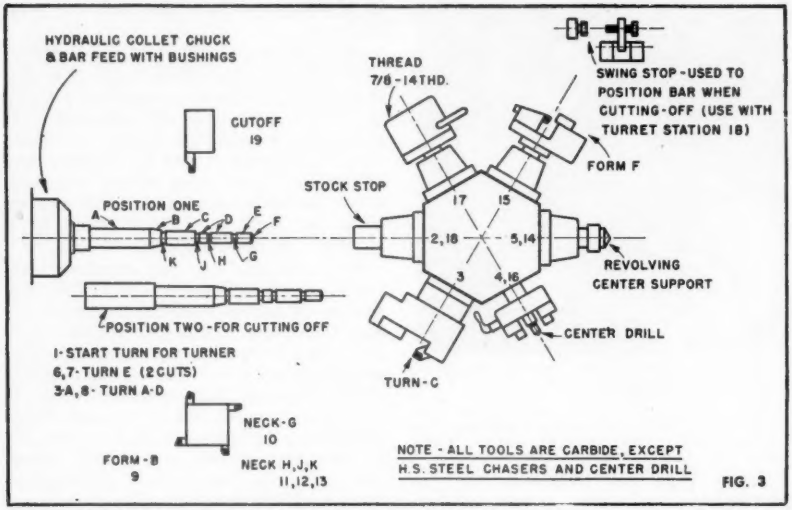
The largest presses in the world will be used in die forging processes to produce airplane parts for defense orders and will be hydraulically powered by triplex pumps made by Worthington Pump and Machinery Corporation, Harrison, New Jersey.

These giant presses—one of 75,000 tons and another of 25,000 tons—will produce parts for war planes at a production rate previously thought impossible. They are expected to achieve outstanding savings in critical materials and manpower.

To hydraulically power a 75,000-ton forging press, five 3¾" x 24" stroke horizontal double acting triplex pumps have been ordered for the Wyman-Gordon plant at North Grafton, Mass. Five similar pumps will go to the Air Force installation at Adrian, Mich., to power a 25,000-ton extrusion press.

These pumps have been ordered by Loewy Construction Company, New York City, wholly-owned subsidiary of Hydro-Press, Inc., designers and suppliers of large industrial presses.

. . . How To Run Small Lots, from page 51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POSITION TWO - FOR CUTTING OFF
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6,7-TURN E (2 CUTS)
3-A,8-TURN A-D
FORM-B 9
NECK-G 10
NECK H,J,K 11,12,13
THREAD 7/8-14 THD.
STOCK STOP
SWING STOP - USED TO POSITION BAR WHEN CUTTING-OFF (USE WITH TURRET STATION 18)
FORM F
REVOLVING CENTER SUPPORT
CENTER DRILL
TURN-C
NOTE - ALL TOOLS ARE CARBIDE, EXCEPT H.S. STEEL CHASERS AND CENTER DRILL
FIG. 3

Fig. 3. A typical bar or shaft job which can be tooled efficiently in accordance with the basic turret arrangement for bar tools.

many times the diameter of the bar. Note that all machining cuts are taken on the bar in Position 1. The part is extended to Position 2 for cutting off.

Stations 2, 18, 3 and 17 are identical with the skeleton tooling arrangement in Figure 1. The tools in Stations 4, 5, 14, 15 and 16 are set up from the list of tools in Figure 1 for use in stations D, E and F.

The sequence of cuts on this bar job follows the numerical listing of the stations on both the cross slide and hexagon turret. For example, operation 1 is a start turning operation with a tool held in the square turret on the cross slide. This start turned diameter is equal in size to surface "C", and the start turning is taken while the stub end of the bar is projecting from the collet. A true turned diameter can, in this manner, be quickly obtained with a short projection.

(Continued on page 100)

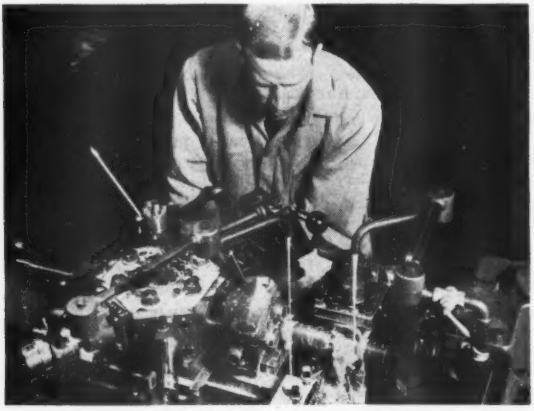

Fig. 4. A six-station turret lathe with a four-position cross slide tool holder is shown with a roller bar support installed in one of the turret stations.

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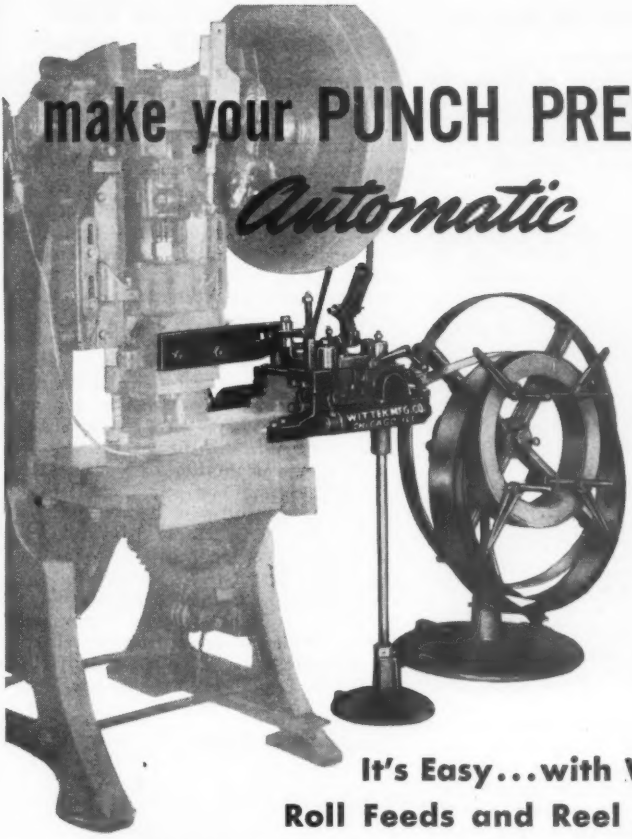

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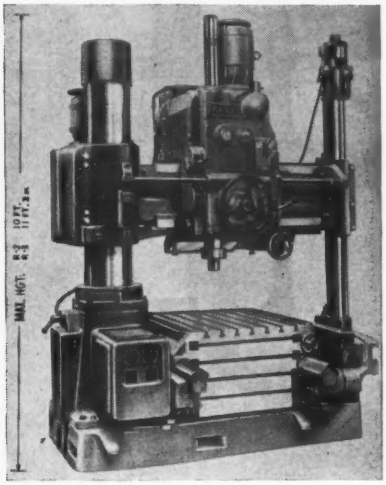
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Production Jig Boring

The Oerlikon Production Jig Borers—Types R-2 and R-3—for precision and production boring, drilling, reaming, tapping, screw cutting, facing and outside turning without jigs, are being introduced in the United States by Cosa Corporation.



These double column machines are designed so that the boring head, cross rail and smaller column can be locked rigidly in any position. The rigid frame, thus created, makes it possible to locate holes—by the coordinate method, using gage blocks or pins—to a tolerance of .0004″ to .0008″ between centers and to drill holes as small as .040″ diameter. Both models have 18 spindle speeds and 12 feeds. The R-2 has speeds from 38 to 1900 rpm and feeds from .0012″ to .031″ per revolution; the R-3 has speeds from 30 to 1500 rpm and feeds from .0012″ to .0472″ per revolution. The motor on the boring head of the Model R-2 is 6 hp; of the model R-3 is 7.5 hp.

For complete details and descriptive literature on these new Swiss-made machines, write to COSA CORP., 405 Lexington Ave., New York 17, N. Y.

Circle Inform-A-Gram No. D2.

New Features Add to Boring Mill Accuracy

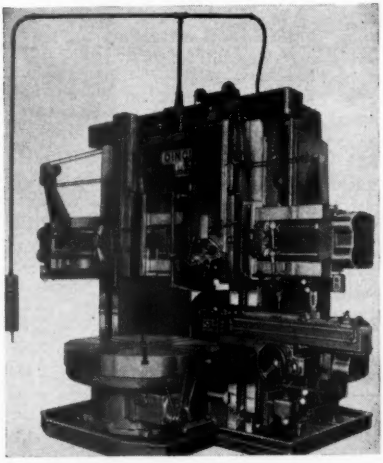
A combination of important design improvements is incorporated in all new Hypro Vertical Boring and Turning Mills, according to the Giddings & Lewis Machine Tool Company, manufacturer of this equipment.

These built-in structural features include: non-metallic bearings for ram and saddle; independent traverse motors for rail and side heads; swivel type pendant control; helical rack and pinion on the ram; clearly marked feed controls; anti-friction bearing table transmission; new 16 feed gear box; table anti-friction thrust and load bearings; two arrangements of mechanical change gear drives; and three electrical arrangements for single shift drives.

Engineered adaptation of non-metallic bearings to ram and saddle marks an important departure in Hypro machine construction. This improved bearing arrangement assures precision operation under hardest service.

Complete details on all these new built-in features of Hypro Vertical Boring and Turning Mills can be secured by writing to GIDDINGS & LEWIS MACHINE TOOL CO., Dept. T&P, Fond du Lac, Wis.

Circle Inform-A-Gram No. D4.



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. . . How To Run Small Lots, from page 96

Fig. 5. Use of the stationary overhead pilot bar provides greater rigidity and allows deeper cuts to be taken with heavier feeds.

of bar stock. Deflection would occur if the stock were extended to full length prior to this start turning operation.

Following the start turning operation, the stock is extended to stock stop Position One on the hexagon turret. This determines overhang of the bar from the collet while the remaining cutting operations are performed. Next, the roller turner in Station 3 of the hexagon turret is advanced to the work and the rolls of this tool pick up and guide on the previously start turned diameter so that the tool may receive an adequate start to complete the turning of diameter "C".

While the roller turner is cutting dia. "C", the carbide cutter in station 3A of the square turret simultaneously turns diameter "A".

The next cut is a center drilling operation in Station 4, after which the end of the bar is supported by the revolving center in station 5. With the bar supported at the front end by the revolving center, cuts six through 13, inclusive, are performed from the square turret on the cross slide. The center support is then removed from the end of the bar.

In Station 15 of the hexagon turret, the end of the bar is formed and, after this forming operation, the part is recentered from Station 16 so that any burr thrown into the center by means of the end forming operation can be removed. Threading the ⅞ in. 14-pitch thread is accomplished with the die head in Station 17.

After the thread is cut, the part is ready to be cut off and, in order to reposition the bar stock for the cutting off operation, the stock stop in Station 17 is again indexed to position and used in conjunction with a swing stop mounted on the turret ram.

Because the machine stop is adjusted to suit the forward position of the ram when stock stop Station 2 is used, an auxiliary stop is necessary for stock Station 18. This requirement is met by the semi-standard swing stop mounted between the turret ram and saddle of the machine. This stop is simply swung into position for stock stop Operation 18, and raised out of place to allow further forward motion of the ram when Station 2 is required.

The shaft in Figure 3 can be tooled completely with carbide and with the tool holders illustrated, may be produced efficiently in lots as low as five to 10 pieces.

Depending upon the material specifications, it would be possible to hold surface "C" to a tolerance of at least .0005 inch with a microinch finish as low as 15.

A job of this nature is ideal for a hydraulically operated collet chuck and bar feed mechanism because the ratio of stock extension per work piece to the mill length of the rough bar is unfavorable to hand-operated bar feed units. Hand-operated units must be frequently adjusted during the course of cutting up the bar, due to stroke limitations of the bar feed head. The hydraulic mechanism feeds the bar continuously for its full length, without adjustment of the bar feed head.

Acknowledgment: from Warner & Swasey's "Blue Chips," Vol. 4, No. 9; and our thanks to Editor Edward L. Murray for permission to reprint.

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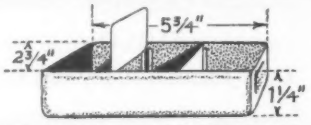

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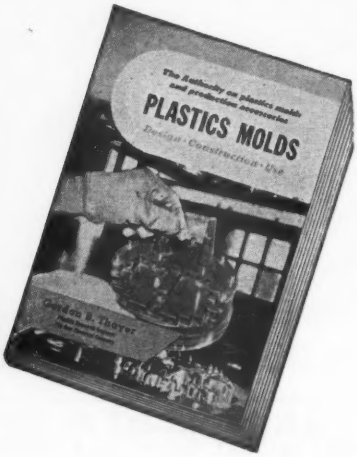

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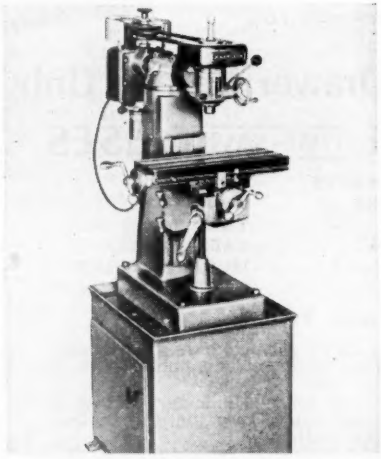

Photo courtesy Johansson & Windle Co.

The machine includes a milling unit which provides spindle speeds (with a 1725 rpm motor) of 180 to 1000; 350 to 1900; and 600 to 3250 rpm. Quill travel is 2-1/16". A handle and wheel feed are provided for drilling and boring operations. Additional features include a positive quill lock and micrometer depth stop graduated in thousandths of an inch. A No. 7 B&S or No. 2 Morse taper spindle is optional. The longitudinal feed is 12", cross feed 4¼", and vertical feed of knee, 12".

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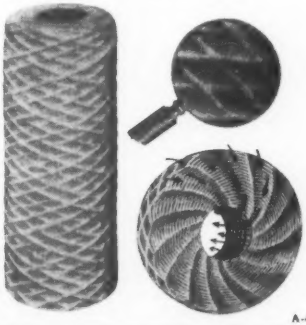

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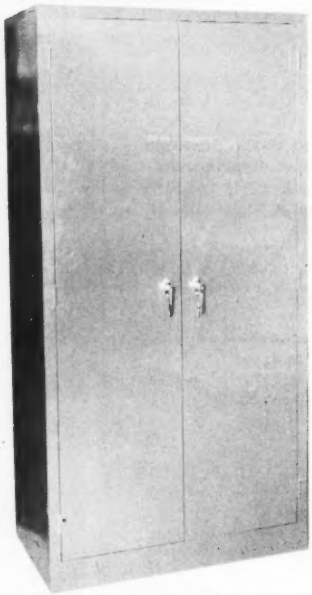

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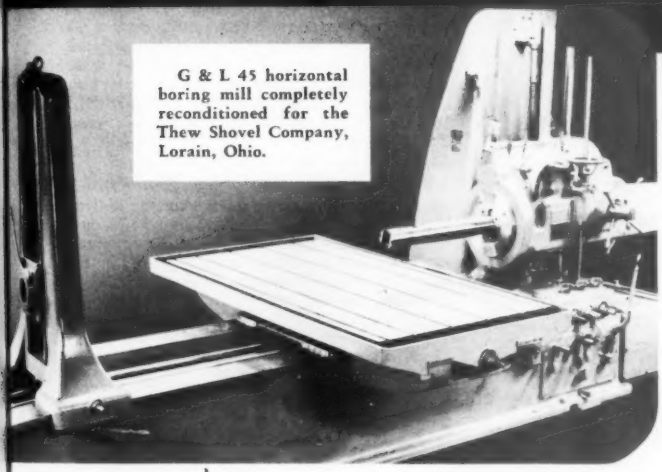

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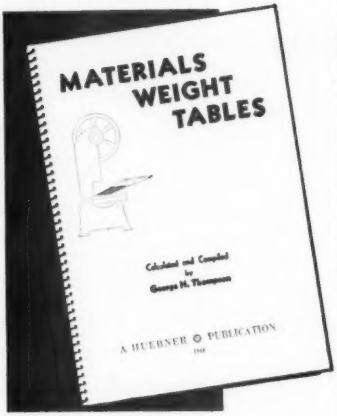

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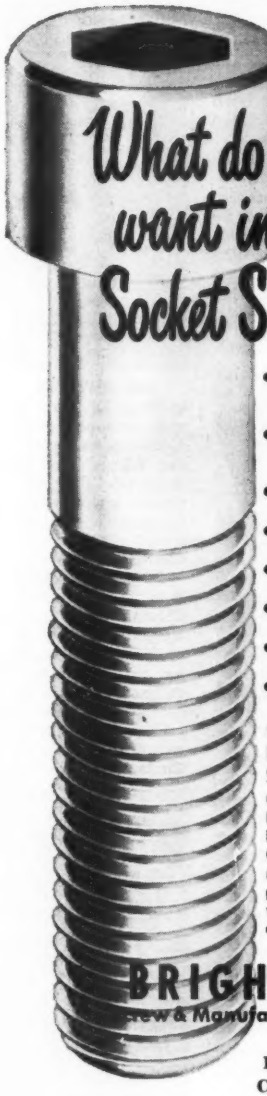
"The Denison Press" is an informative house organ published periodically by The Denison Engineering Co. The current edition contains an interesting article telling how the jewelry industry is using Multipress for fine-detail stamping with production economies in addition to excellent quality results. THE DENISON ENGINEERING CO., 1197 Dublin Rd., Columbus 16, Ohio.
Circle Inform-A-Gram No. F8.

A Convenient Reference Chart, giving the recommended schedules for spot welding low carbon steel, has been published by Ampco Metal, Inc. This chart is a standard 8½" x 11" size and is punched to fit any three-ring binder. AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 46, Wis.
Circle Inform-A-Gram No. F9.

"What's Your Grinding Problem? Here is a Norton trouble shooting manual for the grinding machine operator. There are over 20 pages of practical information especially helpful to new grinding hands. NORTON CO., 1 New Bond St., Worcester 6, Mass., will honor all requests.
Circle Inform-A-Gram No. F10.



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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

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QUICK-PIC

DIE SPRINGS
Bulletin 1951 covers the complete DIE-CO line of springs. This eight-page booklet contains prices, sizes and specifications; has many illustrations.
Circle No. E1.

PRESSES
Wales Twin Column Presses are presented in functionally colored, illustrated Catalog TC. A shearing attachment is also described.
Circle No. E2.

HANDLING
Clark Equipment Company regularly publishes an informative external house organ on materials handling. To get your name placed on the mailing list:
Circle No. E9.

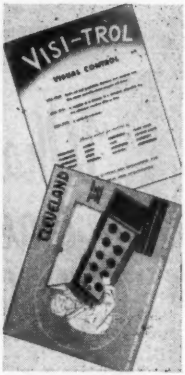
FLUID TRACER
The sensitive tracer head of Sidney Machine Tool Co. transfers every change in contour from the master piece to the cutting tool. A descriptive catalog has been prepared.
Circle No. E10.

DRILL BUSHINGS
Ace offers a unique new reference book for the entire drill bushing industry. Comparison tables provide instant cross reference to some 3023 symbols used by leading makers.
Circle No. E5.

DIE CASTINGS
Hints for designing good die castings are detailed in a well illustrated, 12-page booklet published by The Hoover Company's Commercial Die Casting Division.
Circle No. E6.

VISUAL CONTROL
The Visi-Trol System, which spells out and illustrates your program and then reports progress and status, is described in a new folder.
Circle No. E3.

AUTOMATIC
Attractive illustrations and concise descriptions contribute to the readability of a new bulletin on Cleveland's "AB Dialmatic Single Spindle Automatic.
Circle No. E4.



RIVET TOOLS
HI-SHEAR's re-issued Rivet Tool Catalog reflects changes in tool sizes and basic clearance dimensions, and includes several new items. Its 14 pages contain many drawings.
Circle No. E11.

HACK SAWS
New power blade stock numbers adopted by the hack saw industry are a highlight of W. O. Barnes' latest hack saw folder. Complete prices are listed.
Circle No. E12.

AIR GRINDER
Looking for ways to cut grinding costs? Madison-Kipp's Catalog AT 3006 fully describes the Kipp Featherweight Air Grinder — a real money-saver.
Circle No. E7.

ROLLING MILLS
Bliss' comprehensive, 52-page Bulletin No. 40 gives design and application features for a wide range of rolling mills and accessories; contains valuable reference material.
Circle No. E8.

CATALOGS

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"SUREFEED"

A new positive action automatic feed is the subject of a current Producto bulletin. The "Surefeed" is simple in design, rugged in construction, easy to mount and quickly set up.
Circle No. E17.

MILLER

An illustrated folder covers the Barker Bench-Type Miller, designed for the rapid production milling of small parts that must be held to very close tolerances.
Circle No. E18.

REAMERS

DoALL's new Catalog 51-814 contains 12 pages of illustrations and listings of their complete line of precision reamers. Included are items not usually cataloged as standard.
Circle No. E13.

TOOL BITS

HSS tool bits are introduced in another new DoALL catalog, No. 51-805. Proper grinding procedures are shown.
Circle No. E14.

HYDRAULIC POWER UNITS

A new line of Haskel Power Units and bell-mounted Motor-Pump Units is introduced in 12-page Bulletin No. 210 just published.
Circle No. E21.

COPPER CLAD METAL

New "ElectroShield," a copper clad metal, saves up to 80% of scarce copper, according to an informative booklet issued by the American Cladmetals Co.
Circle No. E22.

BALL BUSHINGS

Twenty-two advantages obtainable through the use of Thomson Ball Bushings are outlined in a new, 12-page catalog.
Circle No. E15.

POWER DRIVING

"Power Driving Equipment for Use with Parker-Kalon Self-tapping Screws for Faster Assembly" describes many power drivers that can drive these screws.
Circle No. E16.

TOOL STEEL

The Tool Steel Selector of A. Milne & Co. consists of a handy chart listing distinctive features and general data on several types of tool steel. Typical analyses are given.
Circle No. E23.

OPTICAL COMPARATORS

Jones & Lamson has published a new Optical Comparator Catalog, No. 402. The company's complete line is pictured and described.
Circle No. E24.

GRINDING UNIT

The improved Nu-Matic Grinder with pneumatic drum is described in the Cleveland firm's latest brochure. It contains pictures, prices and specifications.
Circle No. E19.

PLASTIC MOLD STEEL

"Tooling Up for Plastics," offered by Carpenter Steel, is a 40-page book on the selection, application and heat treatment of steels for plastic molding.
Circle No. E20.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Planned Maintenance of Industrial Plant Lighting*

Today man lives and works largely indoors. This represents an environmental change which inadvertently affects the human eye. The eye has evolved through countless ages, doing its work almost entirely out of doors, in bright daylight, and for simple, long range seeing. Now, it does its work indoors, mostly under artificial illumination, and for long hours at close tasks involving constant accommodation. Too often artificial lighting is inadequate, causing eye strain and unnecessary bodily fatigue.

Design levels of illumination are based on reasonable maintenance of the lighting system. So long as the lamps are replaced as they burn out, and so long as the reflectors and diffusers are kept clean and bright, the design levels will be realized. But, if burned out lamps are not replaced, and reflectors and diffusers are not kept clean, the lighting efficiency will be seriously impaired.

In the Pittsburgh Westinghouse plants, former practice was to clean all luminaires and re-lamp at least once every four months. This practice was followed up to the depression years of the early 1930's. It was then dropped during the depression years, as an "economy" measure.

by **R. G. Edsall**
Works Electrical Engineer
Westinghouse Electric Corporation
East Pittsburgh, Pa.

Extension ladders and stepladders are satisfactory for servicing lighting units on the spot for mounting heights up to about 16 feet.

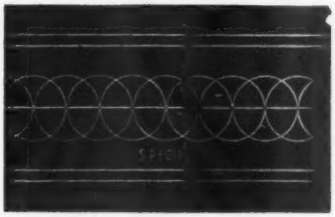
New mercury unit using 1000-watt mercury lamp was used by Westinghouse to light a large generator manufacturing aisle, with 1500-watt incandescent units between trusses for color correction. Maintained illumination is over 45 footcandles.

Survey Reveals Losses

In 1936 a survey revealed that lighting levels in these plants were decreased 65 percent, due to lack of maintenance. Analysis of the lighting systems in use indicated that the cost for cleaning and maintaining would be far less than the cost of the power being lost due to lack of maintenance. Also, it was indicated that the illumination could be restored to original design levels and maintained at this constant level through good maintenance. Thus a rigid maintenance schedule was planned and adopted, in order that maintenance would not be a hit or

(Continued on page 110)

*Reprinted from Westinghouse's "Maintenance News," Volume XVII, No. 2.



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Maintain Production Schedules
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OLIVER DIE MAKING MACHINES

Meet accelerated production demands at lower production costs with OLIVER Die Making Machines. Their efficiency, speed and accuracy, effect time and cost savings up to 60%—and skilled labor is not required. Innumerable plants throughout the Nation are employing thousands of OLIVER Die Making Machines (many in continuous use for more than 25 years) for sawing, filing and lapping operations . . . Be Wise, OLIVERize—Use OLIVER Die Making Machines.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today for Complete Technical Data.

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1435 E. MAUMEE • ADRIAN, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Evolution of the Chase Trademark

As Told by Rodney Chase

One of the most successful Chase salesmen has four feet and doesn't wear a shirt. It's the familiar Chase trademark, probably the best-known trademark in the brass industry, and perhaps one of the 30 leading trademarks in the country.

The trademark as we know it today was introduced to the world on October 6, 1928, in a double page advertisement in the Saturday Evening Post. It created quite a stir, and it eventually prompted an explanation from Rodney Chase, who was then Advertising Manager, and was largely responsible for the development of the trademark. Mr. Chase's remarks were contained in a trade magazine article which appeared in February, 1931. Here is the story:

Original Chase Trademark

"The original trademark of the Chase Companies was a diamond with the word 'Chase' in it. We found that the diamond was, as a trademark sign, such a common one that we couldn't register it in all the different classifications in which our brass products would be sold. We therefore knew that we couldn't continue to use it as our trademark.

"In 1927 we bought the U. T. Hungerford Brass & Copper Co. and, with the

Hungerford Trademark

company, their trademark, a star. The same limitations accompanied the star trademark as the diamond, and we found it was not possible to register it for many classifications. We therefore knew we could not be able to use that trademark either.

"We then faced the job of getting a new trademark and discarding our two old ones. We thought the new trademark should first contain the name 'Chase,' and then in some way illustrate our products.

"When we started to go over the products we should sell under this new trademark, we found such a variety of them that it seemed impossible for the trademark to symbolize them. We not only sold brass and copper, but also bronze, nickel silver, phosphor bronze, iron, rubber, some linen goods (as in shower curtains), and we were not sure that we would not want to mark other articles under that trademark in the future.

"As far as trying to classify our business by industry, we found that our products were used in everything from nurs-

(Continued on page 112)

CHASE 75th ANNIVERSARY 1876 · 1951

Editor's note: The August issue of "Chase News" published by the Chase Brass and Copper Company is their 75th Anniversary edition. It is rich in historical lore of the company and is profusely illustrated with nostalgic scenes from their early days. It is an impressive commentary on our country's free enterprise and what makes it tick. We obtained permission to reprint this story from the Chase 75th Anniversary News, hoping you will find Rodney Chase's delightful narrative as interesting as did we. It conveys a wealth of information covering the derivation, purpose and value of a trademark. This trademark is a banner atop the pinnacle of enviable goodwill and human relations attendent upon an outstanding industrial accomplishment. We are pleased to salute the Chase Trademark. E.W.P.

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GROBET CHATTERLESS COUNTERSINKS

Six staggered cutting edges give shearing cut that eliminates all chatter.

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STOP WEAR on Die Sets

. . . with ACRO Pin Oilers

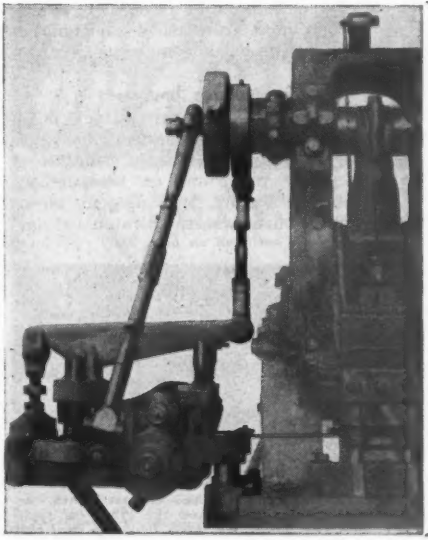
Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminates bushing wear, leader pin scoring, and maintains die accuracy.

Write for FREE Bulletin

describing Acro products
Ask for Bulletin TD-30.

ACRO Metal Stamping Co.

330 E. Reservoir Ave., Milwaukee 12, Wis.



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Send for latest Catalog

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185 ROWLAND ST.
SPRINGFIELD 7, MASS.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Plant Lighting, from page 106

Twin mercury-incandescent units, 400-watt mercury and 750-watt incandescent, provide 45 foot-candles in a typical manufacturing assembly area.

miss proposition, and so that the benefits of the total lighting power load would be realized.

The total area involved in the present planned lighting maintenance program in the Pittsburgh Westinghouse plants is in the order of five million square feet. This total area is subdivided into five plant divisions, for accounting purposes.

In planning the maintenance for all five divisions, the area in each was divided into separate sections. A schedule of cleaning and maintenance was then planned for each section, on a four-month period basis, so that each section is completely maintained three times a year. The periods for cleaning the various sections were staggered, so that during a four-month period each section occurs on the schedule once. During each cleaning period for a section, the luminaires are thoroughly cleaned and all burned-out lamps are replaced. Therefore, at least three times a year all luminaires in each section are in perfect condition and the lighting levels are at design standards.

Broad Program

A wide range of types of lighting systems, luminaires, and light sources are involved in this maintenance program. Practically all office lighting is fluorescent, using ceiling-mounted luminaires. These luminaires are of the four 40-watt lamp type, with egg-crate louver shielding. Production areas vary in physical characteristics, and include low bay areas with ceiling heights of up to 15 feet, medium bay areas with ceiling heights averaging 25 feet, and high bay areas with ceiling heights of 42 feet or more.

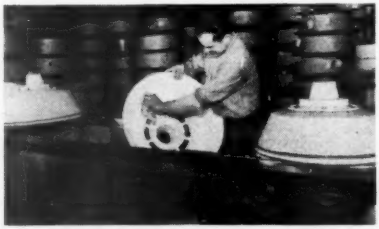
Low bay areas are lighted with either fluorescent or incandescent luminaires. In offices and low bay plant areas, the luminaires are usually serviced from stepladders. The medium bay areas are usually lighted with incandescent or mercury vapor luminaires, or combination incandescent-mercury vapor units. Most of these luminaires are reached from extension ladders, or in some instances from the top of the bridge cranes. In high bay areas incandescent luminaires, or incandescent-mercury vapor units provide the lighting. These luminaires are installed in such a manner that they can be serviced from the catwalk of the overhead bridge cranes. In some instances the clearance between the catwalk on the crane and the roof truss is so great that permanent platforms are mounted on the crane trolleys. All high bay luminaires are equipped with safe-change hangers so that an entire unit can be removed for maintenance. These units are lowered to the floor where cleaning is done, and if necessary new lamps are added as required.

Maintenance of incandescent and mercury vapor luminaires is a fairly simple job. The units are washed, and burned-out or badly blackened lamps are replaced.

Low Voltage Important

Maintenance of proper voltage is an important factor, to be watched with all types of light sources. But it is particularly important on incandescent lamps. As a rule, incandescent lamps should be burned at their rated voltage.

(Continued on page 160)



The cleaning tank has two compartments, one for detergent solution and the other for clean water. The immersion units maintain desirable temperature.

Step Up Production... Cut Costs with

TEMCO (R)

HEAT-TREAT FURNACES

Eight convenient sizes of electric bench-type units to solve your heat-treat problems. Available with either electronic or manual temperature controls.

Priced from $55 to $500

Write today for illustrated Data File giving complete specifications on TEMCO Furnaces so widely used in industry today.

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"PAID FOR ITSELF ON ONE JOB!"

Foredom FLEXIBLE SHAFT MACHINES

have many time-saving applications but users often find a Foredom REPAYS ITS COST on ONE JOB through eliminating an expensive disassembly and re-set job on such tasks as removing high spots on gears and touching up tools or cutters in a production set-up. The secret's in Foredom's extra small handpieces which handle like a pencil and penetrate into spots inaccessible for other tools.

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SPOT THEM LIBERALLY ABOUT THE PLANT for emergency and every-day use. Their cost is negligible. Prices start at $17.75.

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Send your catalog No. M-1747 showing different uses of Foredom Flexible Shaft Machines.

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Address _____
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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Trademark, from page 108

ery equipment to undertaker's supplies, hitting all the high and low points in between; from condenser tubes to copper rivets; from sheet brass to electrical fixtures; there was a great range in the variety of articles. It seemed impossible to get a trademark which could typify or characterize all of them.

"We naturally turned then to illustrate the name of our company, 'Chase.' 'Chase,' or the sign of the chase, or something to do with a chase, or a hunt, was the natural thing to be suggested. We went through the different animals and figures that typified these such as the boar, elk, dog, rabbit, huntsman, archer, spear thrower, Indian, and various other figures. The trouble was that in each case the figure had been registered in one of the many classifications we wanted to go in, or else it was such a common figure that we ran the risk of starting a secondary trade name for our products. That is, we didn't want them to be known as 'Elk Brand,' or 'Deer Brand,' 'Archer Brand,' 'Indian Brand,' etc. We wanted them to be known as 'Chase, this or that.' For this reason, we again discarded all the familiar figures that were known by name.

"Mr. F. G. Cooper, the cartoonist, and myself discussed the trademark many times, and finally I suggested the idea of a centaur. Its advantages were many. It had a certain picturesqueness. It illustrated the idea of 'Chase,' and it was a masculine, virile, aggressive type of figure well suited for our company's products, and the industries they sold to. In addition, the figure was half-man, half-horse, and a little difficult for most people to describe readily . . .

"Therefore, the tendency is for people to talk of it as the 'Chase mark' rather than trying to think what the word is that describes a figure half-man and half-horse. This was exactly what we wanted, and with the idea in mind, Mr. Cooper started to work to design the figure.

"Some thirty or forty different drawings were submitted, changed, corrected, and worked on before the figure was finally as it is today. Muscles appeared in arms; the horse changed from an Arab to a Percheron; the jaw became aggressive; and the tail began to wave in the breeze. Mr. Cooper's fine knowledge of essentials designed a figure that could be reduced to ⅛ of an inch in size without losing its clearness or its identity. The simpleness of the silhouette, the elimination of all useless detail made a figure that could be stamped on a ⅛ of an inch tube, or thrown up on a twenty-four sheet bill poster. We do not know of another artist in this country who could have made such a successful design.

The Chase Trademark

"Some $35,000 of national advertising was spent in the Saturday Evening Post and other magazines just to announce the appearance of the new trademark, and at the same time, letter paper, boxes, price lists, catalogs, circulars, office signs and forms, street signs, and automobile trucks—everything—changed to include the new trademark in the new Chase colors of red, black and white.

"We believe it is a good trademark. It has become well known, and we have heard few criticisms and many compliments on it.

"I will say, however, that there was one criticism. In one of our mills, an old Irishman stood in front of a bulletin where a Chase advertisement was tacked up. He looked for a long time at the picture of our new trademark, then turned and spat on the ground and said to his friend: 'Well, begorrah, ye hav't' be haf man and haf horse to wurk fer Chase'!"

Here's a Good Point!

144

Brand New - Perfect First Quality

Assorted Abrasive Wheels and Points for only

$26.50

Actual Value Over $90

Distributors and Manufacturers of Polishing Wheels, Brushes, Abrasives, Mounted Wheels and Points, Mandrels, Flexible Shaft Equipment, Diamond Compounds and Tools.

Write today for our New Illustrated Catalog.

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9-11 CHURCH STREET PATERSON, N. J.

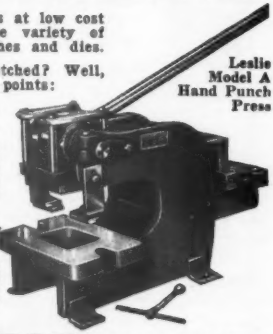
A BLANKING DEPARTMENT for $120.00?

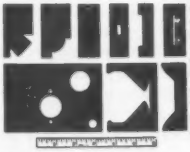
Tool your jobs at low cost from our wide variety of standard punches and dies.

Sounds Far Fetched? Well, consider these points:

- Capacity Up To 15 Tons
- Patented Leaf Provides Positive Punch and Die Alignment
- 6" Throat Depth
- Large Punch Plate and Bed Facilitate Blanking Over Big Areas.

Leslie Model A Hand Punch Press





The Leslie Model A Press is the solution to your short run blanking problems. Write now for illustrated catalog and circular showing punches and dies.

Diagram above illustrates versatility of this Press — each blanking done with one stroke.

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41 YEARS EXPERIENCE

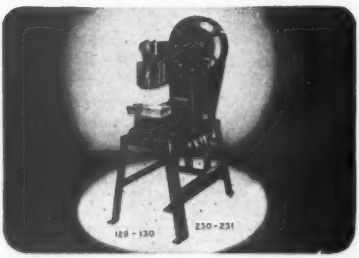
WHITNEY-JENSEN

Nos. 129 - 130

Deep Throat
Power Punch Presses

These efficient presses feature: high speed, deep throats, all steel welded frames, inexpensive auxiliary attachments, various punches and dies from stock. They have a 5-ton safety factor.

Throat Depths—12" and 18"
Capacity—10 tons



WHITNEY METAL TOOL COMPANY

724 FORBES STREET • ROCKFORD, ILLINOIS

SEE ADVERTISERS INDEX. PAGE 137. FOR KEY NUMBERS

Guiding Taps in the Drill Press

In order to start a tap square with a work surface, it is a common practice of toolmakers to drill the hole in the work, then, without moving the work, take the drill out of the chuck and substitute the tap in its place. The tap is then fed down into the drilled hole while the drill press belt is pulled around by hand. This arrangement is generally unsatisfactory because the average drill chuck is not designed to transmit the high torque required for tapping, so that the tap slips in the chuck. The method is also very difficult and awkward for the toolmaker since he must use one hand for pulling on the belt. Belts are not designed to be pulled by hand.

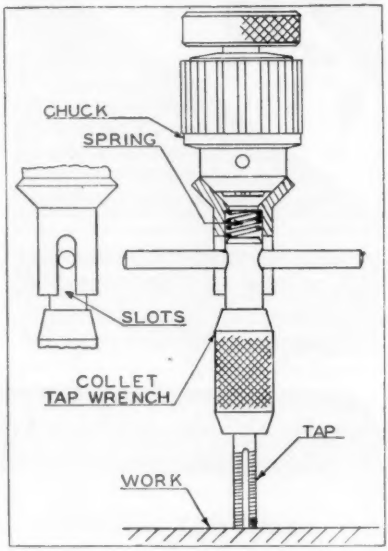
Since the average tap can be rotated easily by hand when using a tap wrench, an attachment that will enable this to be done while the drill press spindle provides axial pressure and guidance, has been made up by the writer with the result that tapping in the drill press is now a simple and easy task.

The tap is gripped in the standard type of toolmakers' collet tap wrench and over this is placed a sleeve which has a close sliding fit on the plain upper portion of the wrench. Two elongated slots are cut into the sleeve to admit the projecting handles of the wrench, and a compression spring is housed in the upper portion of the sleeve so that it exerts pressure upon the flat top of the wrench.

Integral with the sleeve is a conical recess positioned at the upper end. The interior surface of this recess is designed to form a bearing surface for the taper which is machined on the lower part of the Jacobs chuck body. This taper acts as a large conical center and, being hardened, can act as a non-rotating or dead center if necessary.

by **F. E. Riley**
London, England

In use, the tap is gripped in the tap wrench and the attachment, complete with spring, is dropped over the top of the wrench. The drill is removed from the chuck and with the tap inserted in the hole in the work, the drill press spindle is fed down by hand until the lower end of the chuck fits into the conical cup on the attachment. Sufficient pressure is exerted to compress the spring and then the drill press quill is locked against any vertical movement.



The tap is now supported by the drill press spindle and can be rotated in order to tap the hole by using both hands on the handles of the T-wrench. End pressure, sufficient to give the tap a clean start, will be supplied by the compression spring. If it is desired to give the tap a long length start while supported by the machine spindle, the quill can be unlocked and fed down a small amount each time the conical faces tend to become loosely engaged.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Good Illumination, from page 70
mended lighting practice for the entire iron and steel industry.

Welding

The table of the Illuminating Engineering Society gives the figure of 30 foot-candles for welding jobs. According to a recently published study by M. W. Hime, the generation of light is incidental to the process of welding, and the intensity produced locally may be great.

Apparently, on this account, the lighting of welding shops is often ill-considered, it being assumed that enough light is produced by the welders themselves. Goggles, or screens, have to be used to protect the eyes from injury, due to splashing metal, or to infrared, visible and ultra-violet radiation.

When a weld is completed it has to be inspected. There is then no local illumination due to the welding arc. Hime emphasizes that the ordinary lighting of the welding shop is often insufficient to enable inspection to be made without raising the protective goggles, thus exposing the eyes of the welder or inspector to flashes produced by neighboring workers.

Hime wants a series of basic questions investigated, and meanwhile he makes some tentative suggestions for suitable lighting under the circumstances described. An illumination of about 15 foot-candles should be provided on the horizontal plane, at the work level.

The brightness of the ceiling and the walls of the work room should be relatively high. This should be achieved by painting both ceiling and walls in light colors, and planning the installation to distribute a sufficient proportion of the total light output to them. Hime considers that the present practice of painting welding interiors black is bad.

Old Sight

Today many more men of advanced age are busy in industry, due to increased average length of the duration of life. Some slight consideration given to the particularities of advanced age may make those men fully efficient. Usually between the ages 40 to 50 presbyopia (old sight) begins to appear. It is actually a normal change due chiefly to gradual loss of the elasticity of the lens of the eye.

A tool designer of some 42 or 45 years who has always had good eyesight may note that he must position his work (on his head) further and further away for exact seeing. Much can be done to give relief and assistance to such eyes. Different glasses may be needed for working at close range or reading, and for seeing in distance.

In such cases either two different pairs of glasses are used, or the engineer uses glasses the upper part of which is ground for the distance while the lower part is ground for objects at close range.

If the condition be uncorrected, the presbyopic engineer may suffer from pain in the eyes, fatigue, lacrymation (shedding tears), dimness of vision, headaches. Many highly skilled older men can continue to perform with utmost efficiency if they have the proper glasses or if the simple means of assisting the eyes with better illumination is adopted.

People with old sight prefer strong illumination instinctively because this produces contraction of the pupils, and this improves the vision temporarily. Proper lighting helps greatly to avoid eyestrain, while improper lighting shortens the duration of normal seeing. The same holds true for flickering light.

★ ★ ★ ★ ★

. . . Cool Grinding, from page 57
than when ordinary coolant systems are used, and a further benefit is realized in that the work is 100% visible—an important feature in form and shoulder grinding.

This new technique is a proved advantage over ordinary coolant distribution, and especially so in the grinding of the new hard and tough alloys. It must be remembered that the improved alloys for tools are necessarily difficult to grind, for it is their ability to withstand abrasion which makes them good tools. "Cool Grinding" requires no special wheels, all of the ordinary vitreous-bonded wheels being sufficiently porous to permit the flow of coolant.

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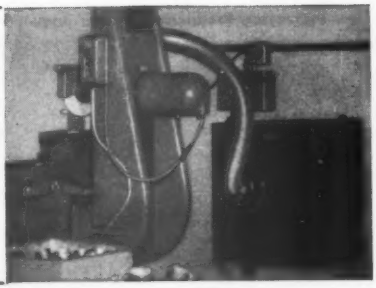

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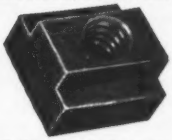

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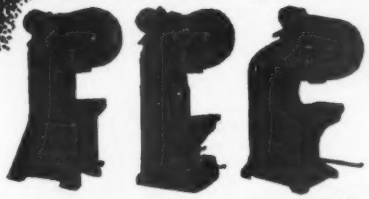

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. . . Increasing Productivity, from page 64

Fig. 22. Photomicrograph of annealed SAE 8640 steel. The structure consists of 75% pearlite and 25% of ferrite. 215 Bhn. Annealing cycle: Heat to 1825° F. for 2½ hours; furnace cooled to 1100° F.; air cool. 50X, Nital etch. Fig. 23. Spheroidized SAE 8640 steel. The structure consists of carbide in ferrite matrix, 160 Bhn. Heat Treat Cycle Heat to 1275° F. for 2 hours; heat to 1380° F. for 1 hour; furnace cooled to 1275° F. and hold for 16 hours; air cool. 1000X, Nital etch.

chine better than the as-cast gray irons for the same hardness level.

The potentialities of the ductile irons in the automotive and related fields are tremendous. It is the authors' opinion that the iron will find wide use in the annealed form containing almost all ferrite, or in the lowest physical as-cast form, which would, incidentally, contain a high proportion of free ferrite.

The object should be to obtain castings having machining properties far superior to those present day castings; at the same time, the ductile irons will provide higher tensile strengths, greater rigidity, and high ductility. It should be recalled that the ductility of gray cast irons is practically nil.

Machining Wrought Steels

The dependence of machining properties on microstructure described for cast irons likewise exists in wrought steels. Preliminary tests made in turning SAE 8640 steel indicate that vast differences in tool life can exist when cutting steels that have been annealed to produce different microstructures.

Furthermore, since annealing and normalizing differ from one plant to the next, and also since the usual furnace annealed procedures do not adequately control cooling rates, wide differences in microstructure are obtainable even by plants specifying similar heat-treat conditions.

Here again for purpose of uniformity, it is necessary to insist upon heat treating to definite microstructures and hardness levels if consistency in machining is required.

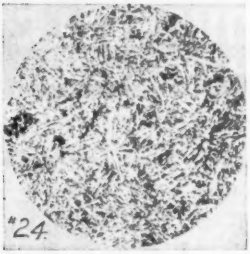
Turning tests were made on 8640 rolled steel bars heat treated in various ways to obtain different structures, but the results shown here should be indica-

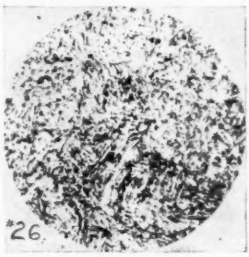
(Continued on page 158)

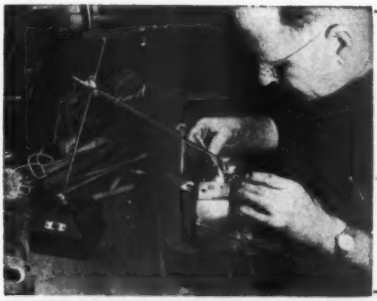
Fig. 24. SAE 8640 steel annealed to produce Widmanstatten structure. The Widmanstatten structure consists of ferrite and pearlite arranged in the characteristics cross-hatched manner. 255 Bhn. Heat Treatment: Air cool from 2200° F. 50X, Nital etch.

Fig. 24. SAE 8640 steel quenched and tempered to produce Martensitic structure. 300 Bhn. Heat Treatment: Quenched from 1550° F. with water, drawn at 1150° F. for 2 hours. 500X, Nital etch.

Fig. 26. SAE 8640 steel tempered to 400 Bhn. The structure also consists of tempered Martensite. Heat Treatment: Water quench from 1550° F., drawn at 1350° F. for 3 hours. 500X, Nital etch.







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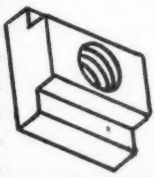

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Heavy Production Grinder for Jet Parts

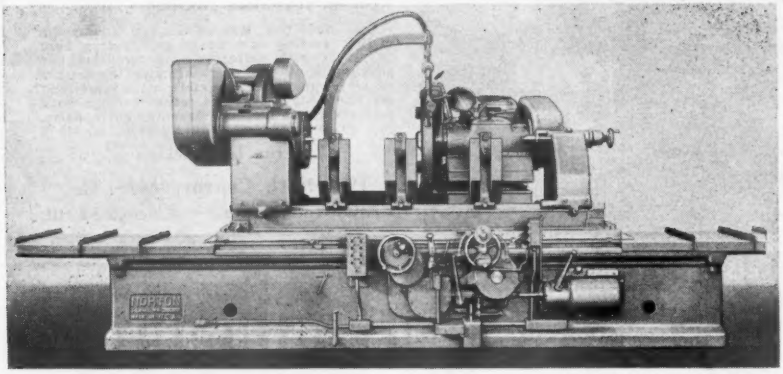

Photo courtesy Norton Company

This new 42" x 72" Special Universal Jet Part Grinding Machine is a heavy production grinder equipped with the universal features necessary for grinding jet engine components. It is massively proportioned throughout to provide extreme stability under the heaviest production demands.

The heavy production-type wheel slide takes a 30" diameter grinding wheel and swivels 180° by power, thus permitting rapid angular settings of the wheel for such operations as may be required. The wheel slide is clamped hydraulically and is operated automatically through an interlock on the swivel motor switch.

The machine grinds full diameter work (42") with the full size (30" diameter) wheel. The wheel is rapidly positioned toward or away from the workpiece by a power mechanism which operates by moving a small lever in the center of the normal operating position. The wheel may be stopped at any point in its travel when being positioned by power.

The wheel spindle unit is of traditional Norton design where long, full bearings enclose a major portion of the spindle body, providing extreme resistance to deflection by wheel pressures. An index on the wheel feed handwheel makes possible settings in work diameter reduction as fine as .0001". Power wheel feed at table reversals is automatic and adjustable for amount of feed.

A sliding table moving on widely spaced ways supports a swivel table for grinding taper work. Both tables are heavily ribbed. The top of the swivel table slants toward the grinding wheel—a design which lends maximum strength, the best coolant drainage condition, and an ideal clamping and aligning surface to the headstock, footstock and table attachments.

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This year's competition, open to engineers, metallurgists, researchers, instructors, welders, students and all others qualified, features two categories: Category A, for papers on "Welding Engineering & Theory"; and Category B, for papers on "Practical Welding Applications."

There will be a first prize of $500 and 29 other cash awards. A full set of rules, entry blanks and helpful suggestions on the preparation of papers can be had from Eutectic Welding Alloys Corp., Dept. P, 172nd St. & Northern Blvd., Flushing, N. Y.

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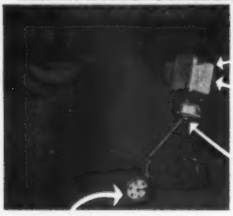

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PUBLICATION

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Royal Oak Tool & Machine Co. offers its latest D-S Grinder Catalog. The D-S Radial Relief Grinder is available in hand-operated and motor-driven models for producing better-cutting, longer-lived taps, counterbores, step drills, center drills, etc.
Inform-A-Gram No. B1.

Milwaukee Surface Plates are fully described in a catalog from J. C. Busch Co. These surface plates are finish-planed and scraped to insure a highly accurate surface. Standard plate sizes range from 3¼" x 4" to 48" x 96".
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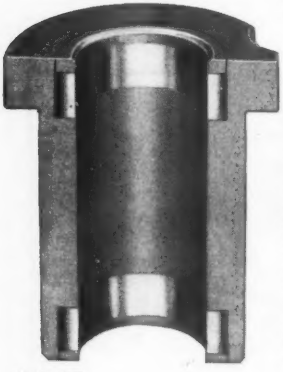

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Inform-A-Gram No. B3.

Three New Hi-Speed Automatic Presses are pictured and described as to operating features, construction, etc., in Di Machine Corporation's latest literature offering. These accurate presses are made in 5-, 8- and 12-ton models, featuring variable speed drive, clutch and automatic brake release, and positive knockout for compound drive.
Inform-A-Gram No. B4.

"Barrel-Finishing with Alundum Tumbling Abrasive" is an informative new Norton booklet that discusses choice of cleaners, rust preventives, operating hints, care of barrel and equipment, etc. Write for your copy of Form 501 to NORTON CO., 1 New Bond St., Worcester 6, Mass.
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PREVIEWS

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The "TEN" Series of Drawing and Stamping Lubricants is described in a bulletin from Forbex Corp. These lubricants are especially made for the severe drawing, forming, stamping, cutting and piercing of stainless steel and other hard metals. They possess great clinging and heat resistant qualities, maintaining a tough, even, unbroken film around the metal under extreme pressure and heat conditions. Write FORBEX CORP., 125 Broad St., New York, N. Y. and ask for Bulletin No. 10-17.
Inform-A-Gram No. B6.

The Robbins Sine-Plate is featured in an informative catalog published by the Detroit manufacturer. Fast and accurate angular inspection setups can be made in a few moments. Any angle, single or compound, is set up by inserting standard gage blocks between the Sine-Plates. Two sizes of the Sine-Plate are described in the catalog, along with magnetic models for machining operations.
Inform-A-Gram No. B7.

The Severance "All Star" Catalog of Tools is a new handy size booklet designed to give complete selection and ordering information in the shortest possible time. A graphic index is featured and the company's line of midget mills, deburring cutters, countersinks and other tools is cataloged. SEVERANCE TOOL INDUSTRIES INC., 730 Iowa St., Saginaw, Mich.
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The Luma Combination Etchtool and Demagnetizer etches, demagnetizes, anneals and solders. The hardest steel can be permanently marked with the ease of a pencil. Luma Electric Equipment Co. will supply detailed information.
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GEMCO Precision Shapers. Three types of these shapers — universal, production and plain — are pictured and described in Bulletin D, now procurable from General Engineering & Mfg. Co. All are LUBRIGARD protected.
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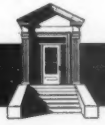

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Series 1600 Electric Furnaces are fully described in Thermo Electric Mfg. Company's handy reference file. These heavy-duty models are excellent for heat treating tools, dies and parts, and for general laboratory work.
Inform-A-Gram No. B11.

The Heavy Duty Shoplifter now has new accessories that make it easy for one man to move heavy dies up to 2000 lbs. from storage rack to inclined bed of press. Economy Engineering Co. will supply literature.
Inform-A-Gram No. B12.

Peaslee Engravers' Cutters are the subject of Bulletin 10. Immediate delivery is promised on these close tolerance cutters. They can be used on high speed milling machines, duplicators, pantographs and die sinkers.
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Inform-A-Gram No. B15.

U. S. Automatic Press Room Equipment is featured in a new catalog brought out by the New Jersey manufacturer. It describes and pictures slide feeds, roll feeds, stock straighteners, stock reels and coil cradles—all designed for use in connection with punch presses. Address requests to U. S. TOOL CO., INC., Dept. T&P, Ampere (East Orange), N. J.
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"People Work Better When They See Better" is an illustrated brochure published by Edroy Products Co. It shows how the Magni-Focuser Binocular Eye Loupe makes precision work easier, faster and better. Write to EDROY PRODUCTS CO., 480 Lexington Ave., New York 17, N. Y.
Inform-A-Gram No. B17.

Your Engine Lathe can be converted to a turret lathe with the Jefferson 5-Tool Tail Stock Turret. Four sizes up to 24" swing are shown in a new folder from Jefferson Machine Tool Co.
Inform-A-Gram No. B18.

One Hundred and Thirty-Eight Models of hydraulic valves, each in varying sizes, are pictured and described in the 28-page Rivett Catalog Section No. 203. This three-color book furnishes working drawings and specifications for each model and size valve. Also shown are cut-away views for each series and operational diagrams of the five piston designs. RIVETT LATHE & GRINDER, INC., Dept. T&P, Brighton 35, Boston, Mass.
Inform-A-Gram No. B19.

Illustrated Specification Sheets cover descriptive and operating details on the No. 27 SAFAG Hard Metal Tool Grinding and Lapping Machines. These machines will grind and lap carbide tools for any kind of Swiss or Swiss-type screw machine. Write the U. S. distributor, CARL HIRSCHMANN CO., 30 Park Ave., Manhasset, N. Y.
Inform-A-Gram No. B20.

Lucas Boring Mills now feature automatic power positioning, integrally cast, four-way beds with 4-point support, a complete range of feeds and speeds to one spindle, pendant control and vibrationless V-belt drive to spindle at high speeds. Complete details are procurable from Lucas Machine Div., The New Britain Machine Co.
Inform-A-Gram No. B21.

The Levermatic Collet Chuck is described by text and pictures in a new, eight-page catalog issued by Sutton Tool Co. The catalog details outstanding construction features. These include pressure adjusting ring with ball detent lock, positive cam closing collar, three hardened cam levers and parallel grip design collet.
Inform-A-Gram No. B22.

Hardened and Ground HSS Blanks in any decimal diameter to ½", and in any length, are covered in new Price List D-3 from William T. Hutchinson Co. These blanks are particularly applicable for punches, gages, measuring wires, and special tools.
Inform-A-Gram No. B23.

The AMC Demagnetizer is described in an Alofs Mfg. Co. circular. One pass through this improved demagnetizer removes all magnetism from processed parts.
Inform-A-Gram No. B24.

Onsrud Air Turbine Grinders are featured in current Bulletin 1129. These portable tools are designed for vibration-free operation that reduces operator fatigue. The bulletin tells how the three Onsrud models can speed grinding and deburring jobs.
Inform-A-Gram No. B25.

Illustrated Bulletin No. 24 points out construction features and gives dimensions, specifications and prices of Cardinal Machine's Type B Speed Vise.
Inform-A-Gram No. B26.

BARNES WAVY SET BAND SAWS

CUT THIN SECTIONS WITHOUT STRIPPING OF TEETH!

Barnes wavy set blades are especially designed to cut thin sections without stripping. Each tooth removes its proportionate share of metal without taking the shock of a full cut. This distribution of shock load prevents stripping—assures efficiency for which Barnes Blades are famous. Used on all Band saw machines—you can depend on Barnes all ways.

YOUR DISTRIBUTOR CARRIES A FULL STOCK OF BARNES SAWS

BARNES

ESTABLISHED 1919

W. O. BARNES CO., INC.

1297 TERMINAL AVE. • DETROIT 14, MICH.

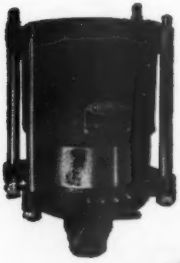
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Air-Operated Dial Feed Tables are the subject of The A. K. Allen Company's newest illustrated brochure. Models 11EA and 11EB have completely enclosed working mechanism, rack and gear drive, and flame hardened working parts.
Inform-A-Gram No. B27.

An Illustrated, Four-Page Brochure covers the Durant Scrap Chopper. This unit fits any power press with any type of feed; features economical operation.
Inform-A-Gram No. B28.

Excellent Heat Treating Results without polishing or buffing are now obtainable with Phoenix-Brand Non-Scaling Compound, according to a brochure from the manufacturer, The Parker Stamp Works, Inc. Full details are given on this easy-to-use, specially compounded powder.
Inform-A-Gram No. B29.

Diamonds and Long Drills are among the inexpensive items described in the 128-page catalog offered by Eastern Tool Supply Co.
Inform-A-Gram No. B30.



FIRST
IN
DIE CUSHIONS
NONE BETTER
15,156 INSTALLATIONS
(There must be a reason)

For { DEEP DRAWING
PAD CONTROL
KNOCK OUTS

Complete Die Cushion Engineering service at your disposal without obligation on all cushion applications.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7, MINNESOTA

An Owner's Manual for Bliss S-2 Presses is now available from the manufacturer. This 28-page book, containing complete operating and maintenance instructions for latest design straight-side, double-crank presses, will accompany each shipment of this type of press. For customer convenience, the manual includes a list of specifications of the press as it was shipped from the Bliss plants. E. W. BLISS CO., 1375 Raff Rd. S.W., Canton, Ohio.
Inform-A-Gram No. B31.

Condensed Technical Information on 14 of the more popular tubing steels is contained in a six-page bulletin from Babcock & Wilcox. It gives such information as analyses, physical and mechanical properties, creep strength and oxidation resistance. Send for Technical Bulletin 12F to THE BABCOCK & WILCOX TUBE CO., Dept. T&P, Beaver Falls, Pa.
Inform-A-Gram No. B32.

Your Entire Stock of Drills can be seen at a glance when you have a Huot Drill Dispenser. A new circular tells you how time can be saved by this dispenser, which has compartments holding a gross of small sizes or a dozen or more of the larger ones. Three models are described in the circular.
Inform-A-Gram No. B33.

Carbide Tool Prices. Super Tool Co. has issued a 22-page Net Price Schedule that prices all 25 types of standard solid carbide and carbide tipped tools made by the company and described in their Catalog No. 50 and supplements. Write for a copy to SUPER TOOL CO., 21650 Hoover Rd., Detroit 13, Mich.
Inform-A-Gram No. B34.

Speed Reducers and Gearmotors. A pocket-size catalog of Abart Speed Reducers and Right Angle Gearmotors has been announced for distribution. This 96-page book gives complete engineering data on how to select the proper speed reducer to fit requirements, including horsepower ratios and installation graphs. For a copy of Catalog No. 51, write ABART GEAR & MACHINE CO., 4834 W. 16th St., Chicago 50, Ill.
Inform-A-Gram No. B35.

Style JS Empco Jack is a new device that can save considerable time in setting and keeping equipment level. VI-SORB mounting pads, for absorbing vibration, are available as optional equipment. The jack will support 20 tons and lift 8000 lbs. The Enterprise Machine Parts Corp. will furnish specifications and prices.
Inform-A-Gram No. B36.

Cold Rolled Steel Gage Handles are the subject of Form 4322, prepared by Aurelio Tanzi Corp. These durable handles are unaffected by oil or grease. They are made in eight sizes Taperlock and four sizes Trilock. Prices and sizes are listed in the literature. AURELIO TANZI CORP., 430 Jefferson St., Brooklyn 37, N. Y.
Inform-A-Gram No. B37.

Index Model 55 Improved Vertical Mill has a speed range of 80 to 2700 rpm, combined with a 1 hp drive, 3¼" quill and extra-rugged spindle mounted on oversize precision ball bearings to give a capacity of ⅛" to 1½" end mills in steel. Descriptive literature is available from Index Machine Co.
Inform-A-Gram No. B38.

Precise Grinder-Millers provide accuracy to .0001" for cylindrical, internal, external and form grinding; and for milling with carbide or high speed steel midget mills. A complete, illustrated catalog has been prepared by Precise Products Co.
Inform-A-Gram No. B39.

Mirror Finishes in minutes instead of hours can be obtained with "Micro Mesh" Pure Diamond Lapping Compound. A-1 abrasive Laboratories offer complete details.
Inform-A-Gram No. B40.

The Mead Air Operated Rotary Work Feeder is featured in the company's Air Power Catalog. This work feeder deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations are accurate to .002".
Inform-A-Gram No. B41.

Many Bending Operations are illustrated in the new Dreis & Krump Catalog P-51. It covers the complete line of Chicago Power Bending Brakes and Power Universal Box and Pan Brakes.
Inform-A-Gram No. B42.

TRIPLE PURPOSE MACHINE
FILES...SAWS...STONES
ILLINOIS DIE FILING MACHINE
An accurate, smoothly-operating machine that files, saws and stones the most intricate die shapes... eliminates tedious hand operations...reduces costs. It is quality-built for long, trouble-free service ... hardened and ground shafts running in bronze bushings minimize wear. The holding chuck and clamping device provide perfect file alignment.
Sawing
Write for descriptive literature
Stoning
ILLINOIS TOOL WORKS
2501 N. Keeler Ave. • Chicago 39, Ill.
MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

An Interesting, 52-page Book of drawings, specifications and prices is obtainable from Noble & Stanton, Inc. It gives full information on the firm's line of over 300 standard jig and fixture parts.
Inform-A-Gram No. B43.

The 2½X Headband Magnifier of Carl Zeiss, Inc., is described in a current leaflet. This magnifier features a free working distance of 8" to 10", permitting unhindered use of hands.
Inform-A-Gram No. B44.

"Quality" Dies, completely and exhaustively inspected at every step in the diemaking process to make sure that the dies are right, are the subject of Quality Hardware & Machine literature.
Inform-A-Gram No. B45.

Model A "RFC" Roll Feed is suitable for 4-, 6- and 8-ton power presses. It cannot slip and it reverses instantly. Literature covering the complete "RFC" line can be had from Roll-Feeds Corp.
Inform-A-Gram No. B46.

New! **Model B800 Series**
TOOL and CUTTER GRINDERS

Four New Improved Models of the Tool and Cutter Grinders Available Now!

Distributed Only Through Franchise Dealers

See Your Authorized "K-O" Distributor Or Write For Descriptive Literature

K. O. LEE CO.
ABERDEEN, S. D.

A New System for Measuring Surface Flatness with the Griswold Huet Optical Straightedge is shown in a current catalog. A beam of light is utilized as a straight-line reference in locating and measuring, with high precision, variations in surface flatness. Address requests for illustrated Catalog No. 20 to F. T. GRISWOLD MFG. CO., Dept. T&P, W. Lancaster Ave., Wayne, Pa.
Inform-A-Gram No. B47.

"Pantography" is a new George Gorton booklet that fully explains this process and shows what Gorton Tracer-Controlled Pantographs can do for you. With these special machines, literally thousands of operations can be speeded up, improved in quality and lowered in cost.
Inform-A-Gram No. B48.

"Safety Plus" Socket Screw Products, cap and set screws, nuts, taper pins and studs are designed by The Chicago Screw Co. to provide a tight, low cost fastening for any heavy-duty purpose. Literature can be had upon request.
Inform-A-Gram No. B49.

Both Angular and Parallel Misalignment are corrected by the Erickson Full Floating Holder, featured in current Catalog G. For use with reamers, taps, die heads and other tools, this holder comes in collet, bushing and taper types.
Inform-A-Gram No. B50.

A New Booklet tells how "Hi-Rockwell" Drills can drill clean, bright, accurate holes in hardened steel with a Rockwell hardness of C34 to C68. Champion Tool Co., Farmington, Mich., is the manufacturer.
Inform-A-Gram No. B51.

Standard Carbide Single Point Tools are covered in new DoALL Catalog 52-817. This illustrated, eight-page booklet includes a helpful, six-point outline for securing the best results with these tools and recommendations for proper rough and finish grinding procedure, as well as standard catalog listings of straight turning tools, lead angle turning tools, threading tools, etc. THE DoALL CO., Dept. T&P, 254 N. Laurel Ave., Des Plaines, Ill.
Inform-A-Gram No. B52.

New Peg Rack Trucks are completely described in a bulletin from Lloyd Engineering Co. Made for safer transit of parts in the production line, these trucks have 90 pegs of ⅜" square steel which are 7" long, covered with fibre and cushioned at the bases. The pegs are set at an angle of 15°. LLOYD ENGINEERING CO., 59 Stephen St., Belleville 9, N. J.
Inform-A-Gram No. B53.

Ace "Star Dust" Diamond Lapping Compounds and Diamond Powders provide the subject matter for informative Bulletin No. C-10, now available. "Star Dust" is accurately crushed and graded to achieve uniform nodular shape, permitting all particles to work. Finishes of less than half a microinch are thus assured.
Inform-A-Gram No. B54.

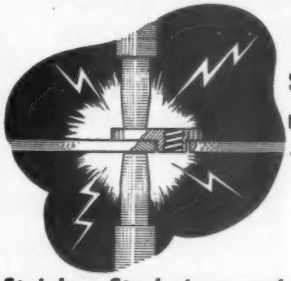
Features and Specifications of all Geneva Dial Indicators are listed in a detailed folder offered by Chicago Dial Indicator Co. With a lever arm instead of a multiplicity of gears, this dial indicator has fewer moving parts — meaning lower cost and less chance for trouble and repairs.
Inform-A-Gram No. B55.

Anyone Can Read the new Central Read-Rite Micrometer. Numbers that automatically appear on the thimble, as you adjust the micrometer, eliminate the computations usually required in taking a micrometer reading. This and other measuring tools are shown in The Central Tool Company's 12-page Catalog 30.
Inform-A-Gram No. B56.

An Inexpensive Method of drilling holes of various shapes is explained in Watts Bros. Tool Works' latest catalog. By this system, square, triangular, pentagonal, hexagonal and octagonal holes can be drilled.
Inform-A-Gram No. B57.

Special Boring Bars, equipped with standard Microbore tools, are fully described in the illustrated catalog of DeVlieg Microbore Co. Each tool is independently adjusted by proved micrometer, vernier principle.
Inform-A-Gram No. B58.

OHIO WELD NUTS
For economical Spot Welding



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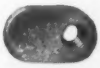
SN Spotweld Nuts
No retapping required!
Thread sizes in stock,
(Low Carbon Steel)
No. 6-32 to ⅜-24

Stainless Steel sizes made to order in production quantities.



For dependable Projection Welding

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WS Square Weld Nuts
Thread sizes in stock,
(Low Carbon Steel)
No. 6-32 to ½-20

No retapping required!
No burning or discoloration!

For samples and welding information, send to
THE OHIO NUT & BOLT COMPANY
19 First Avenue., Berea, Ohio

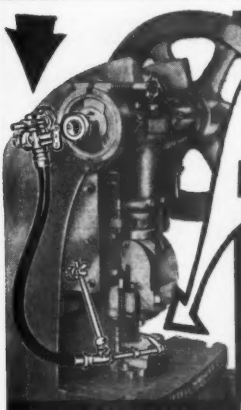
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Style "S" Master Collets feature an independent double dovetail lock-clamp that anchors the pad in place. There are no threaded holes in Master Collets or Pads. Hardinge Bulletin "S" tells the whole story.
Inform-A-Gram No. B59.

The Sheldon Precision Lathe Catalog discusses design and operating features that permit the Sheldon Lathe to handle the great bulk of everyday toolroom and die shop jobs.
Inform-A-Gram No. B60.

"High Speed" Staking Machines are described and illustrated in a recently released circular. They can handle any job of staking or riveting fixed or movable joints; anything in eyeletting, burring, etc.
Inform-A-Gram No. B61.

The Heimann Transfer Screw Set is a self-contained, complete tool that provides a fast and accurate means of transferring screw holes. The manufacturer is mailing a new price list.
Inform-A-Gram No. B62.



keep HANDS and FINGERS away from PRESS RAM

LITTELL

Air Blast Valves

Eject Automatically by Air . . . not by Hand

SAVE TIME . . . Faster production and lower labor costs
SAVE AIR . . . Reduce air consumption 92 percent
SAVE DIES . . . No damage to dies due to clogging
SAVE HANDS . . . Keep operators' hands and fingers out of danger zone
SAVE MONEY . . . Insurance premiums are lower when accidents are reduced.

QUICKLY INSTALLED—Littell Air Blast Valves can be installed on any make or size press in only a few minutes.

F. J. Littell MACHINE CO.
AIR DIVISION
4197 RAVENSWOOD AVE., CHICAGO 13, ILL.
— District Offices: Detroit and Cleveland —

Write for Catalog

A New Cutting Compound, especially valuable for heavy-duty work uses, is described in a current Motch & Merryweather brochure. Triple-Chip Heavy-Duty Anti-Weld Soluble Oil withstands terrific heat for long periods, adheres to the tool and carries through to the cutting edge, mixes readily with water and resists contamination. It does much to keep chips from welding to the tool, because of its tenacity to the tool and its maintenance of the high heat transfer of water. Other features of rust resistance, corrosion resistance, etc., are described in this well illustrated publication. THE MOTCH & MERRYWEATHER MACHINERY CO., 715 Penton Bldg., Cleveland 13, Ohio.
Inform-A-Gram No. B63.

A Precision Carbide Tool Grinder is the highlight of current Baldor literature. It has balanced armature and wheels, runs smoothly on large ball bearings. Other features, fully detailed in the literature, include wet or dry grinding, ½ hp, 3400 rpm motor, and 6" silicon carbide wheels.
Inform-A-Gram No. B64.

Putnam Tool Company's 116-page Catalog No. 52 is just off the press. It lists over 1000 sizes and types of faster cutting, longer lasting end mills. There are many additions, including the new Postiv-Lok series.
Inform-A-Gram No. B65.

The Heavy Duty No. 150 "Mitl-Mite" is a new magnetic base holder for instantly mounting test indicators to flat or curved surfaces. Detailed descriptive literature can be obtained from the manufacturer, Enco Mfg. Co.
Inform-A-Gram No. B66.

A Brand-New Power Driving Bulletin has been prepared by Parker-Kalon. It describes and illustrates many of the types of power drivers for production line use of P-K Self-tapping Screws for faster assembly. Included are portable and suspended electric and air tools, as well as single and double spindle automatic hopper fed inserting machines for the driving of one or more screws simultaneously. The bulletin also contains a discussion of proper bits and sockets. PARKER-KALON CORP., 200 Varick St., New York 14, N. Y.

Inform-A-Gram No. B67.

DoALL Taps are presented in a comprehensive,, 16-page catalog, No. 51-813. This new booklet includes illustrations and specifications on hand, machine screw, nut, pulley, pipe, tapper, hook and special taps. Also included are nine pages of technical data and suggestions for ordering taps. THE DoALL CO., Dept. T&P, 254 N. Laurel, Des Plaines, Ill.

Inform-A-Gram No. B68.

The Lectroetch Stencil Printer uses regular printer's type for emergency and short-run marking. Stencils will mark finished precision metal parts quickly, without burrs, strain or deformation by the Lectroetch Stencil Process. Detailed literature is obtainable.

Inform-A-Gram No. B69.

"Die Steels for Hot Work" is an attractive and informative publication of Vanadium-Alloys Steel Co. The die steels described are designed to meet every hot work requirement. All grades are available in bars and forgings.

Inform-A-Gram No. B70.

DIE-CO Die Springs are presented in an illustrated, 10-page catalog designated Bulletin 1951. Dimensions and prices are given for all types of springs. These include compression springs, jig and fixture springs, square wire springs, extension springs, special springs, etc. A discount sheet is attached. Write to THE DIE SUPPLY CO., 1400 Brookpark Rd., Cleveland, 9, Ohio.

Inform-A-Gram No. B71.

Reltool's Extensive Catalog 50 illustrates the company's complete line of arbors, dovetail cutters, end mills, counterbores and other tools. A feature of this line are Woodruff Key Seat Cutters, furnished in both shank and arbor types.

Inform-A-Gram No. B72.

The Buck "Ajust-Tru" Chuck permits .0005" precision with scroll chuck rechucking speed. It handles all collet and step collet work. Buck Tool Co. is sending out a detailed bulletin on this production-boosting chuck.

Inform-A-Gram No. B73.

You're LAPS AHEAD with

ACE *Star Dust*

DIAMOND LAPPING COMPOUNDS AND DIAMOND POWDERS

Laboratory Grading Does it!

MIRROR FINISHES IN MINUTES ON DIES, TOOLS, MOLDS AND PRECISION PARTS

ACTUAL MICROPHOTOS PROVE STAR DUST SUPERIORITY AT A GLANCE . . .

STAR DUST is so accurately crushed and graded by Ace's new laboratory method that it achieves uniform nodular shape, permitting all particles to work. Thus you are assured finishes of less than half a micro inch, quicker than ever before. By contrast, note lack of uniformity and the flats in the "unnamed" brand that prevent accurate finishing!

● STAR DUST USERS REPORT AVERAGE SAVINGS IN POLISHING TIME OF MORE THAN 78%: Available in ophthalmic-tipped tubes or in new applicator gun that delivers minimum quantities to individual jobs and eliminates all waste . . . In all grit sizes as fine as .0001".

Write today for informative bulletin No. C-11

ACE ABRASIVE LABORATORIES | 250 WEST 57th STREET NEW YORK 19, N. Y.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Three Distinctive Tool Bit Materials to meet various applications have been developed by Gorham Tool Co. Available from stock in standard sizes for immediate delivery, Gorham Ground Tool Bits and Turning Tools can be obtained in these materials. Folder No. A-75, giving descriptions, sizes and prices, is procurable from GORHAM TOOL CO., 14400 Woodrow Wilson Ave., Detroit 3, Mich.
Inform-A-Gram No. B74.

Zagar Engineering Manual No. 1 includes dimensional drawings and detailed data on all models of broaching machines, collet fixtures and multiple spindle, gearless drill heads. Also contained in this booklet are several action photos.
Inform-A-Gram No. B75.

Hardness Testing for all types of applications can be done with one of The Shore Instrument & Mfg. Company's Sclersocope models. Illustrated literature covering these instruments is offered to T&P readers.
Inform-A-Gram No. B76.

SAVE UP TO 85% ON TOOLS-MACHINERY AND PARTS!!
NEW! 200 PAGE CATALOG
STATIONARY or PORTABLE D.C. ARC WELDER
For light or heavy industrial work. Delivers 300 Amps., continuous — or 350 to 400 Amps., intermittent. Designed to weld continuously for hours. . . This unit is built around a rugged, heavy duty, aircraft type generator and comes complete with Pulley reactor, output controls, Hi-Lo switches & rheostat mounted on sturdy steel frame. Operates on 15 H.P. for maximum output. Gas or electric motor.
97.50
WAR SURPLUS SAVINGS
JUST OFF THE PRESSES! IMMEDIATE DELIVERY! ORDER NOW !!
Our latest and biggest CATALOG of NEW and SURPLUS BARGAINS. Thousands of items at UNHEARD OF LOW PRICES! SAVINGS UP TO 85% in Hand & Power Tools, Electrical Supplies, Industrial Machinery, Gas and Electric Motors, Winches, Hoists, Machine Tools, Gauges, Welding Equipment, Pneumatic & Air Tools, Raw Stocks, Aluminum, Brass, Copper, & Steel in Sheets, Bar, Rods, Tube & Extrusions, Nuts, Bolts, Rivets, Screws, Wire, Cable and a Huge Stock of HYDRAULIC SUPPLIES including Cylinders, Valves, Pumps, Motors, Fittings, Tubing, etc. While these items last we will continue to sell them at typical low Palley Prices. Write for your copy of this Bargain Packed Catalog TODAY!
PALLEY SPECIALS on HYDRAULIC PUMPS & CYLINDERS
HYDRAULIC PUMP or MOTOR GEROTER TYPE
Logan Gerotor type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 G.P.M at 1200 RPM at 1000 PSI with 5 H.P. Can also be used as Hydraulic fluid motor. 3/8" stand pipe ports. ½" splined shaft for pulley or direct attachment. 5½" dia., 7" long. Used but condition guaranteed.
19.50
Special! HYDRAULIC CYLINDER
Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for road-farm-shop machinery.
29.95
PJ STRATO POWER PUMP
With built-in variable flow control valve in head. Positive displacement piston type. Displacement capacity: 2 gal. per min. at 1500 RPM at 1250 PSI. Pressure limit 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotates either direction without adjustment . .
19.50
No. 3 HYDRAULIC CYLINDER
Double action. Bore is 1" — Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs.
5.75
P-4 VICKERS ANGLE PUMP
Positive displacement type, angle piston. Displaces .507 cu. in. per revolution. Has capacity of 6 gal. per min. at 3000 RPM at 1500 PSI., continuous, 1875 for 15 sec. Operating speed of 3750 RPM, intermittent maximum, 4500 RPM. Rotates to the right only.
19.49
4 WAY VALVE
Poppet type. Pressure balanced. Oil at neutral position. Piston type with built-in relief valves for limit of cylinder strokes. 5/8" AN tube size (7/8"-14 thread) inlet & outlet. Ports to cylinder are 1/2" AN tube size (3/4"-16 thread).
9.75
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Order from this ad. All sales final
All prices F.O.B., Glendale. Pay by M.O. or check. P.O.'s accepted from D.&B. firms. ½ deposit with C.O.D.'s.

Stainless Tubing Steels. Technical Bulletin 19 of The Babcock & Wilcox Tube Co. contains condensed data on analyses, oxidation resistance, thermal treatment and mechanical, electrical and physical properties on ten of the most popular austenitic and ferritic stainless tubing steels. THE BABCOCK & WILCOX TUBE CO., Dept. T&P, Beaver Falls, Pa.
Inform-A-Gram No. B77.

Kasson Precision Collets and Attachments are available for immediate delivery from stock, according to literature published by the manufacturer, General Die and Stamping Co. A featured item in the line, the "Klutch-Kollet," is a step collet for accurate chucking to 2¾" dia. It has a soft head for easy boring.
Inform-A-Gram No. B78.

The Walls Manual on Finishing contains descriptions of the company's streamlined Standard D-4 Abrasive Band Grinder and other styles and sizes. The portable D-4 unit is equipped with improved band tension control and specially designed protective motor hood.
Inform-A-Gram No. B79.

Nesting Type Tote Pans, made by J. L. Lucas & Son, Inc., are 20" long x 12" wide x 6¼" deep. They have drag holes and handles at both ends. Complete details on these new pans are procurable from the manufacturer.
Inform-A-Gram No. B80.

All Types of Holding Fixtures for machine shop production are designed and built by Swartz Tool Products Co., Inc. There are 75 models and fixture sizes from which to choose. Catalog 941 gives all the facts.
Inform-A-Gram No. B81.

All Types of Benco Pushers and Collets are described in the Cleveland firm's current catalog and price list. Among the many types of Benco Pushers are solid, squirrel cage, heavy-duty cage type, "Multi-Split" and Master with alloy pads. Most standard sizes are carried in stock for immediate delivery.
Inform-A-Gram No. B82.

Portage Non-Power Feed Rotary Tables combine easy rotation with rigidity and accuracy at all settings. Two sizes are offered. An illustrated catalog sheet has been issued which describes construction and operating features. THE PORTAGE MACHINE CO., Dept. T&P, Akron, Ohio.
Inform-A-Gram No. B83.

DI-ACRO Benders, brakes, shears, rod parters, punches and notchers are presented in O'Neil-Irwin's latest, 40-page "Die-Less Duplicating" catalog. This booklet points out their many applications for experimental work and speedy production of duplicated parts.
Inform-A-Gram No. B84.

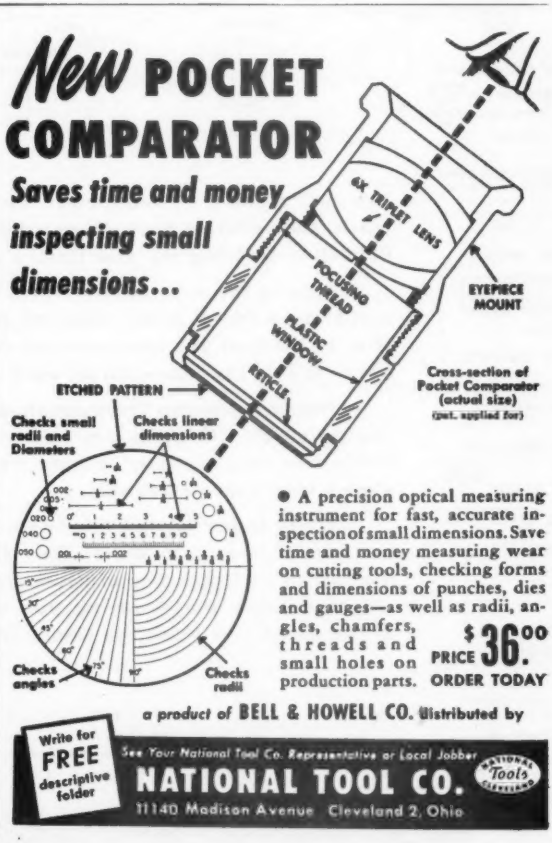
Long-Lasting ABC Bushings are made from steel containing chromium and/or tungsten. These accurate and concentric drill bushings are made in four standard types. A descriptive catalog has been released by the manufacturer, Accurate Bushing Co.
Inform-A-Gram No. B85.

A Portable and Accurate Hardness Tester is the subject of J. P. Newman Company's latest mailing piece. Rockwell C, B and E scales are all available in this one instrument. The new tester has a 3" work opening.
Inform-A-Gram No. B86.

Copper Head Laps, available from stock in standard sizes, ⅛" to 2½" diameters, are presented in a Boyar-Schultz folder. There is nothing to wear out on these rapid-working laps except the copper sleeve, which is quickly replaceable and adjustable to the correct size.
Inform-A-Gram No. B87.

The Milwaukee Profile Grinder, subject of a Rice Pump & Machine Co. folder, features ½ hp motor for non-stalling power, collet chuck for extreme accuracy, and compound tilting table. It is available in two models, "Standard" and "High Speed."
Inform-A-Gram No. B88.

A Large Assortment of Small Tools is described in Precision Supply & Machine Company's new illustrated catalog. Polishing wheels, brushes, abrasives, mounted wheels and points, mandrels, flexible shaft equipment, and diamond compounds and tools are included.
Inform-A-Gram No. B89.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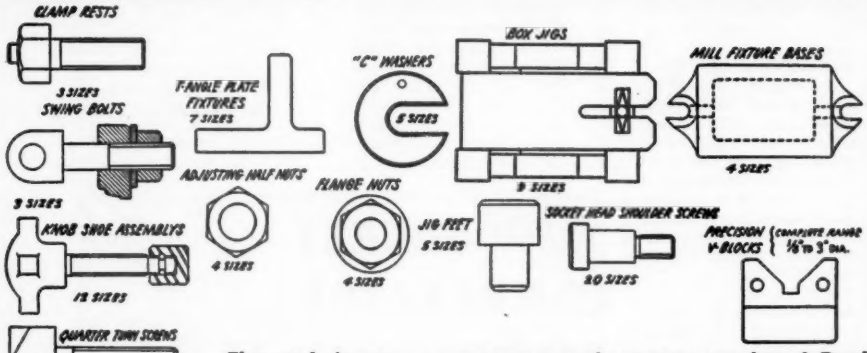

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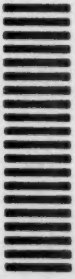

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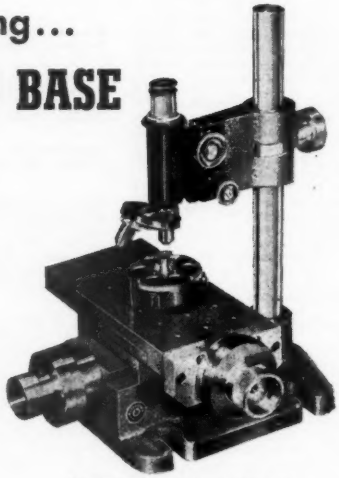

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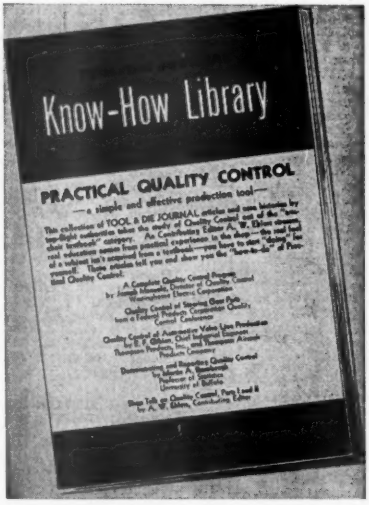

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NTDMA Protests Proposed Wage Ceiling Boosts

Tool and die executives have strongly protested to the Wage Stabilization Board that area rates proposed by the special panel appointed by the Board would have serious inflationary and unstabilizing effects throughout the entire metalworking field. George S. Eaton, executive secretary of the National Tool and Die Manufacturers Association which represents more than 500 contract shops, termed the WSB recommendations "unrealistic, unwarranted and unstabilizing."

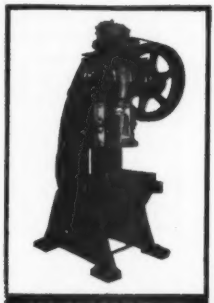
The report of a special study committee, with public and labor members generally in agreement, recommend area ceilings which would permit unusually large wage increases. Industry members of the committee dissented from the majority report in its entirety.

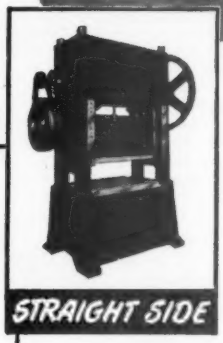
Requests from industry witnesses for area rates were based fundamentally on using current regional wage surveys and providing adequate manpower controls. Neither of these recommendations was followed, Mr. Eaton asserted.

Recommended rates would increase skilled classification rates in tool shops above the highest rates generally paid in every one of the 23 tooling areas.

Other problems foreseen by both contract and captive tool and die executives are: (1) Pressures that would destroy long term contracts in the metalworking industry; (2) Unions would tend to seek the highest approved area rates; and (3) Labor pirating would be encouraged rather than discouraged, for new plants would, obviously, offer the highest rates allowable.

Tool and die officials have advised the Wage Stabilization Board that its labor pirating problems can best be met through the Board's strict enforcement of present Wage regulations.





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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Westinghouse Workers Set Safety Record

Employees of the Westinghouse Electric Corporation's Transformer Division at Sharon, Pa., who recently set a world's safety record of 5,440,000 man-hours of work without a lost-time accident, are 10 times safer at work than outside the plant, according to a recent accident survey. The 7000 workers compiled their outstanding record between January 16 and June 5 of this year, according to Frank L. Snyder, division manager.

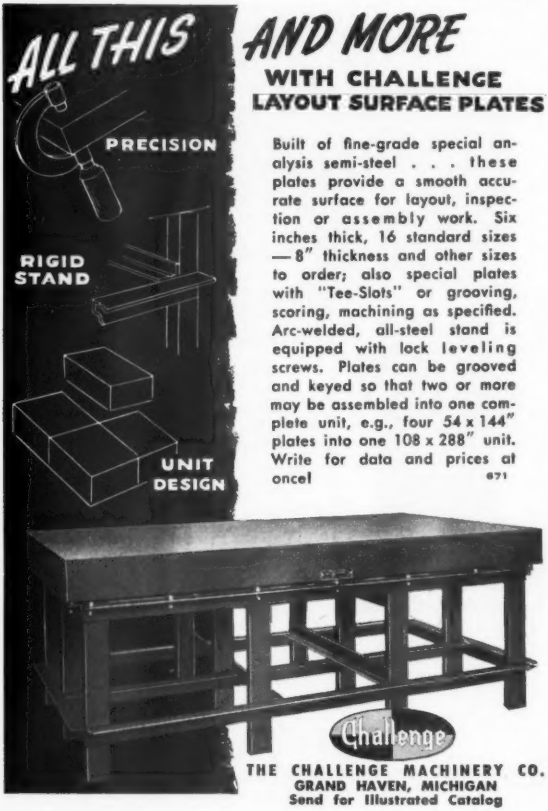
"The result of the accident survey we made certainly does not mean that our employees are reckless after they leave work, but it does emphasize the care and patience practiced on the job," Mr. Snyder said.

As an indication of the success of the plant's program, Mr. Snyder pointed out that the Transformer Division has achieved five First Place awards in the heavy machinery division of the National Safety Council's annual contest, the latest such award covering the fiscal year 1950-51. In addition, it has earned the Council's highest honor — the Distinguished Service to Safety Award—for three consecutive years.

The plant's safety program reaches employees on all levels, according to Mr. Snyder. Each new worker is given a safety lecture and several demonstrations, as well as a complete and adequate complement of the safety equipment required by his job.

An executive safety committee meets monthly to initiate and execute policies and practices, and each department has its own safety committee which meets monthly to administer the program within that department.

Full-time safety inspectors maintain constant watch over working procedures and administration of safety policies. Each supervisor talks at least once each month to the employees under his charge relative to some safety item or matter pertaining to their work.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Eight "Musts" for Production Foremen

Eight "musts" will assure top management that its information, skills and techniques are effectively applied at the first-line production supervisory level, The American Society of Mechanical Engineers was told at its recent fall meeting.

The tasks, to be performed by shift foremen, are: 1. work distribution; 2. job instruction; 3. work simplification; 4. human relations; 5. getting new employees off to the right start; 6. directing technical assistants; 7. making necessary reports; and 8. receiving instructions.

Although this may seem simple, it became evident to the speaker, E. S. Howard, manager of production training for the Minnesota Mining and Manufacturing Co., St. Paul, Minn., after interviews with some 70 first-line production supervisors from his own and other companies, that in the overwhelming majority of the cases the supervisor actually had no clear concept of exactly what his job entailed or what was required of him.

"It is not difficult to produce evidence," Mr. Howard said, "that much . . . training effort is not effective and that first-line supervisors do not actually apply the management information, skills and techniques around which the supervisory training is developed."

A survey among staff experts and production authorities showed that a person's "boss"—his immediate supervisor—is the person to whom he listens with a different set of ears than he listens to anyone else, Mr. Howard said.

To assure application of training at the first-line supervisory level, a man's boss must be trained to train him, according to Mr. Howard. This means that general foremen must receive training on how to instruct their shift foremen. The eight "musts" were drawn up arbitrarily as covering the job of first-line shift supervisors.

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"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

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Also makers of—
BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
Write for information

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Conservation of Metals in Electric Housewares

Makers of electrical houseware appliances are finding new, ingenious ways to keep consumers supplied with such items as toasters, flat irons and heaters and are still managing to save critically scarce materials for defense production.

The National Production Authority, U. S. Department of Commerce, has released the findings of a survey which shows that the industry is continuing production with greatly reduced amounts of nickel, copper and aluminum.

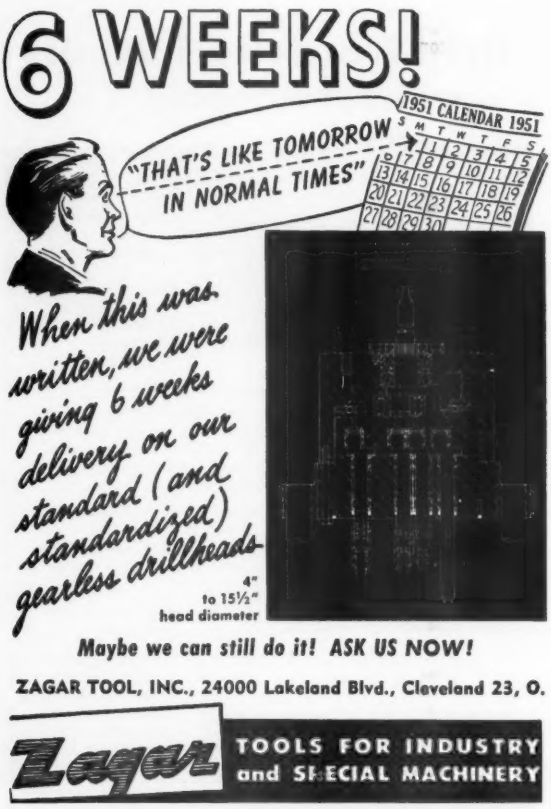
A virtual casualty in World War II because of Government controls on manufacture, this industry is in the forefront now in discovering and adapting ways to get the greatest output from the supplies of nickel, steel, copper and aluminum now available.

Military need for nickel is tremendous. It is required in material such as tank armor, jet engines, electronics equipment, etc.

Though the electric housewares industry used only 678,980 pounds of nickel chromium wire and 1,199,330 pounds of nickel in other forms in 1950, nickel is the chief factor controlling the volume of production of small electric household appliances, NPA states.

Nickel limits output because no satisfactory substitute has been found for it in resistance materials for heating elements, for plating to stand up to conditions of heat and abrasion, and in alloys for springs, thermostats and electrical contact parts subject to extreme heat.

As an example of the industry's conservation practices, one manufacturer has reduced the nickel plating content of toaster shells, grill covers and bases and iron tops by 30 to 50 per cent. The same firm is changing nickel-plated internal parts to aluminized steel, and installing drip pans to reclaim nickel solution previously lost.


6 WEEKS!
"THAT'S LIKE TOMORROW IN NORMAL TIMES"
1951 CALENDAR 1951
When this was written, we were giving 6 weeks delivery on our standard (and standardized) gearless drillheads
4" to 15½" head diameter
Maybe we can still do it! ASK US NOW!
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Zagar
TOOLS FOR INDUSTRY and SPECIAL MACHINERY

More Apprentices Needed for Defense Production

Apprentice workers in industry must be greatly increased in number if national defense production goals are to be achieved, according to Harry A. Winne, vice president of engineering, General Electric Company.

Speaking recently before 2300 alumni of G-E's Schenectady Apprentice Training Program, Mr. Winne said that "only the possibility of awful retaliation by a vastly-strengthened American productive machine" can assure peace.

"If Russia is to be deterred, we must deepen our productive capacity, and then fill it," he stated.

At the Schenectady Works alone, according to Mr. Winne, expansion of vital production for military and civilian needs, requires "a very considerable strengthening of our working force during the next 12 months, with attendant requirements for new supervisors."

"As every facet of our industry looks toward expansion, so too must apprentice power be increased many times over in quantity, in quality; apprentice power to produce the horsepower, the electric power, the firepower essential to national and global security and well-being," he said.

The G-E official suggested it might eventually prove necessary to have "some sort of draft deferment consideration" for apprentices in industry to assure a sufficient store of trained manpower in years ahead.

Mr. Winne decried the fact that in the public mind skilled work "has somehow lost the prestige it so worthily deserves." He cited as a common occurrence the mechanically-inclined young man who turns down a career in the shop because he feels the work socially unbecoming.

"If industry is to take into its ranks an abundant flow of high-caliber apprentice candidates, this notion must be eliminated," he declared.

THIS Solid Carbide Boring Tool is what you need for precision BORING of DEEP, SMALL HOLES

This Bokum tool provides a practical way to bore to greater depths in ratio to diameter. Finish bore often in one pass. More rigidity permits higher speeds without chatter. *Send for Catalog 948.*

Come to Bokum with your BORING PROBLEMS

Bokum high-speed steel tools for general boring and threading are distinguished by their helical backed off form, which produces a smooth, clean, precision bore. **Ask for Cat. 1139-6.**

Carbide-tipped boring and internal threading tools. **Cat. 398**

All Bokum tools available in sets in assortments of your own choice. **Cat. Supl. No. 1139-6**

Tool Holders for holding Bokum Boring Tools in lathes and turret lathes. **Cat. 483**

Resharpening fixtures to prolong the life of Bokum Boring Tools. For small tools Nos. 00000 to 3. **Cat. AB-1.** For large tools Nos. 4 to 12. **Cat. AB-4-12**

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SINGLE POINT BORING TOOLS — INTERNAL THREADING, BOTTOMING AND FACING TOOLS — CARBIDE TIPPED TOOLS

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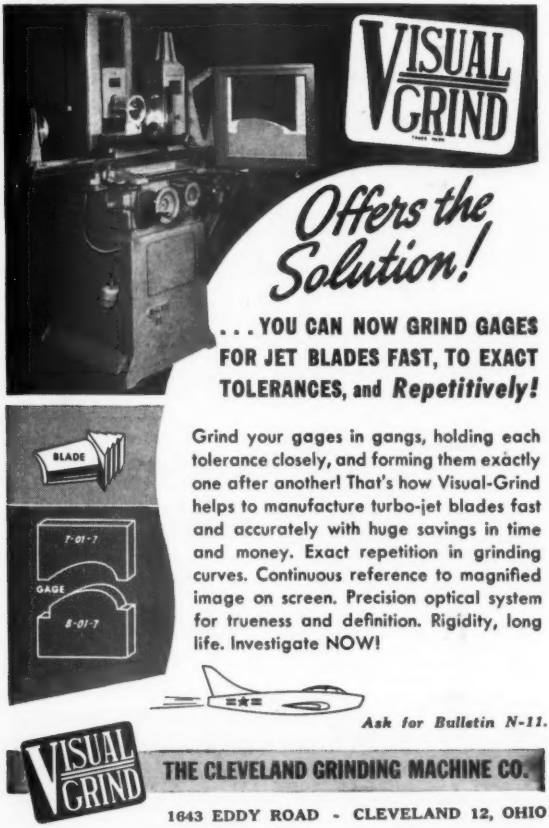
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Management and the Vending Machine*

The United States has just about lapped the field in the development of mechanical gadgets. And when it comes to the vending machine we have outdone ourselves. In this country it is possible to get anything from a full meal to a squirt of perfume on a lady's handkerchief by the coin-in-the-slot technique. And if you haven't got the right change. don't worry! For the modern vending machine is a sure fire change-maker and will serve you up a pack of cigarettes with the pennies you get back from your quarter neatly nestled within its cellophane wrapper. It can even split up, say, a half dollar so that you can have that nickel you need to purchase a candy bar. Yes, most of us have a day-to-day acquaintance with the mechanical vendor and meet it everywhere from the barber shop lavatory to the neighborhood movie. It is no wonder then that many companies have permitted these robot salesmen to enter their plants to provide for the needs of their employees.

Of course, the vending machine raises problems when it is in a factory. What to do with the profits? Do the machines cut into the employee's working time? These are among the questions that must be answered. Certainly, no management can expect to get much production if its personnel is constantly clustered around the soft drink dispenser. On the other hand, the pause that refreshes may be an assembly line accelerator if it is not abused. To learn something about Cleveland management opinion of the vending machine and its policy regarding it, we recently called a number of companies. All but one of the companies allowed vending machines in their shops. On what to do with profits, management was about evenly split between using it to reduce cafetria losses or appling it to the employee welfare program.

*Reproduced, through courtesy of The Associated Industries of Cleveland, from the Association's September 15th Newsletter.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BLADE
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Grind your gages in gangs, holding each tolerance closely, and forming them exactly one after another! That's how Visual-Grind helps to manufacture turbo-jet blades fast and accurately with huge savings in time and money. Exact repetition in grinding curves. Continuous reference to magnified image on screen. Precision optical system for trueness and definition. Rigidity, long life. Investigate NOW!
Ask for Bulletin N-11.
VISUAL GRIND
THE CLEVELAND GRINDING MACHINE CO.
1643 EDDY ROAD - CLEVELAND 12, OHIO

Here is what some of the executives to whom we talked told us about vending machines and company policy concerning them.

Company A:

"We permit no vending machines in the plant. Soft drinks, cigarettes, candy and the like are sold only in the cafeteria during lunch hours."

Company B:

"We have two soft drink dispensers. A concessionaire services them. Company gets small percentage of profits which are credited to cafeteria's receipts."

Company C:

"Our company has candy, soft drinks and cigarette vending machines. Our 'Old Guard' or the 'Old Timers' Club gets profit from cigarettes. Cafeteria is credited with money taken in by the candy or soft drink route."

Company D:

"Our cafeteria gets profits from soft drinks, candy and cigarette machines in plant. This helps reduce cafeteria deficit."

Company E:

"Yes, we permit all kinds of vending machines. We have not found that they affect production, and cafeteria receives profits."

Company F:

"We have cigarette, peanut and candy machines in shop. No soft drinks; they are time wasters. Profit goes to Employees' Mutual Benefit Association."

Company G:

"There are all sorts of vending machines in plant. We simply credit profit to 'miscellaneous income'."

Company H:

"Company Athletic and Social Club receives profit from the soft drink, candy and cigarette dispensers in our shop."

Company I:

"We permit vending machines of all descriptions and apply their profits to cafeteria receipts."

Company J:

"There are soft drink vending machines in the plant. Commissary receives profits."

Company K:

"Entire profit from vending machines—and we have all kinds—goes to Bowling Fund."

Company L:

"Mutual Benefit Association is given profit from candy and peanut machines. Cafeteria gets money from sales of soft drinks."

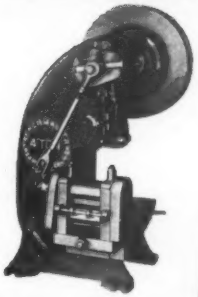
Company M:

"Our company has a 'flower' fund. Profits from numerous vending machines go to this."

Company N:

"We use any profits that we make from the various vending machines around the plant to finance activities in which employees participate; i.e., bowling, baseball clubs, picnics, etc."

WIN $100.00 FOR AN IDEA!



Have you a **new** or **unusual** BENCHMASTER Punch Press or Mill application? Have you **converted** either tool to a special purpose machine, increasing production or saving cost of custom built tools?

WE WILL PAY CASH PRIZES for winning uses of Benchmaster machines, awards being based upon novelty, ingenuity, and practicality!

5 PRIZES:
FIRST PRIZE: $100.00 Bond
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HOW TO WIN:

Write a simple description of your Benchmaster application. No fancy presentation required. Give comparison of production rate with former method of manufacture, include other advantages, savings, etc. Photo if possible.

THAT'S ALL! **But don't wait**—get your description in NOW! Contest closes Jan. 12, 1952. Awards made Jan 31, 1952. Mail to:

benchmaster PUNCH PRESSES AND MILLERS

2952 West Pico Boulevard, Los Angeles 6, California

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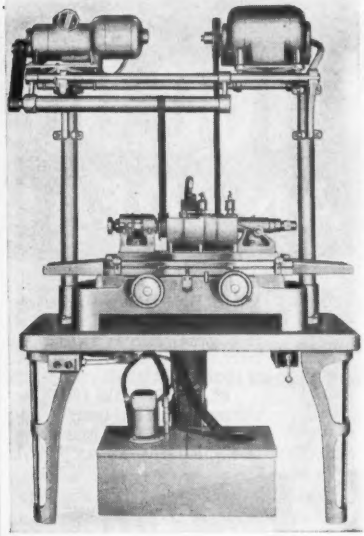
Investigate—

the QUALITY

Compare—

the WORKMANSHIP

CRYSTAL LAKE GRINDERS gives you the machine to hold close tolerances and GUARANTEES the Micro Inch Surface Finish on Perforators, Gages and all-around Toolroom work.



No. 750 Plain Cylindrical Grinder

Write for catalogs, Cylindrical or 6 x 12 x 15" Surface Grinders.

CRYSTAL LAKE GRINDERS

Since 1910

Crystal Lake, Illinois.

"RFC" ROLL-FEEDS

Precision Feeds For All Presses

- Easily installed on any press
- Can't slip. Reverse instantly
- Feed in thousandths
- Maintain original setting. No ratchets or pawls to wear down and affect feed spacing.

Write for descriptive literature TODAY.

ROLL-FEEDS CORPORATION

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An Electrix Affiliate

"WHAT DOES THIS MEAN, CLAPBOTTOM . . . ARE YOU HINTING FOR A NEW COMBUSTION SAFEGUARD INSTALLATION?"

COURTESY WHEELCO INSTRUMENTS COMPANY

Illinois Ranks High in Skilled Worker Training

Illinois is setting an example for many of the other States in building up the ranks of skilled workers through apprenticeship, it was revealed in a recent address by W. F. Patterson, Director, Bureau of Apprenticeship, U. S. Department of Labor, before the Illinois State Federation of Labor Convention in Springfield.

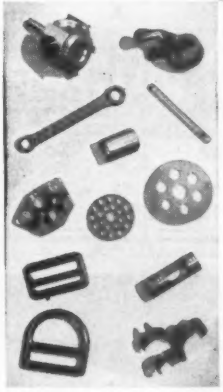
"Illinois," he said, "ranks fifth among the States in the number of apprenticeship programs established. Throughout the State there are as many as 1480 of these programs in which over 8220 employers are participating. This splendid record has been due in large measure to cooperation of American Federation of Labor unions and employers working together in joint apprenticeship committees. As a result... more than 1800 apprentices completed their apprenticeship during the fiscal year ending June 30, and have been added to the ranks of the skilled work forces in the State.

"That other States are running a close race with Illinois is shown by the fact that over 38,080 apprentices throughout the United States completed their apprenticeship during that period; and approximately 200,000 additional apprentices are now in training. The record number of apprenticeship completions is convincing evidence of the returns now being received as a result of the apprenticeship programs established since the end of World War II. The object of the national apprenticeship program is to assure that all workers in the skilled labor force will have the benefit of the all-round training provided by apprenticeship.

"While the progress of apprenticeship since the war has been greatest in the construction industry, the upswing in apprenticeship activities now underway in the metal industries to provide for the skilled manpower required for defense production bids fair to match the record in the building trades."

ROTO FINISH

GIVES YOU 5 OUTSTANDING ADVANTAGES for Deburring, Descaling and Finishing Operations



1. Eliminates tedious hand filing, scraping, polishing, deburring, etc. to save many man hours.
2. Provides absolute uniformity in quantity lots.
3. Maintains exacting tolerances on precision parts where no dimensional change is allowable.
4. Imparts a finish mechanically that was formerly considered possible only by hand methods.
5. Low initial cost — requires minimum maintenance. No exhaust systems required.

Send samples for free demonstration

Roto-Finish COMPANY

associated with The Sturgis Products Co.

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ORIGINATORS OF THE ROTO-FINISH PROCESSES

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CUT BORING COST 35%

Replace old style hand feed with revolutionary ACRO-BORE BORING UNIT.

- MAINTAIN CLOSE TOLERANCES and SMOOTH FINISH.
- Easily attached to BRIDGEPORT HEAD in ONE MINUTE.
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HAND WHEELS
HAND KNOBS
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Blank or Machined - from stock

A LIMITED AMOUNT OF
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IN NOVEMBER AND DECEMBER
FOR MAKING SMALL, FLAT

Profile Gages

We specialize on small flat profiles; templates of unusual shape and close tolerances. Send prints for prompt information and costs.

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ALL GAGES MADE FROM
B & S FLAT STOCK

HARDENED and GROUND HSS BLANKS

Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

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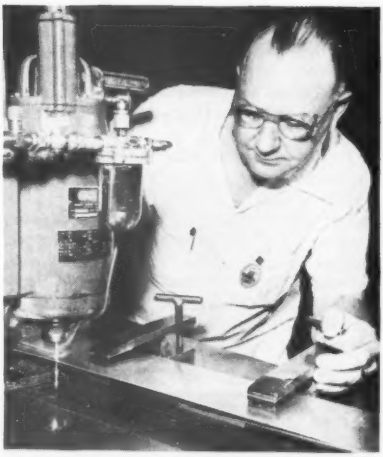
WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.

Pressure Oiler Attachment Increases Router Production

A pressure oiler attachment for tilt table routers, developed by George W. Holcombe, an employee in the Material Preparation Department of Texas Engineering and Manufacturing Company, Inc., Dallas, Texas, has reduced manhours in routing operations by approximately 12½ per cent, and at the same time has added more than 100 per cent to cutter life before replacement is required.

Other advantages resulting from the use of Holcombe's device include cleaner cuts on the routed parts and a consequent reduction in the burring time required.

Holcombe's development consists of a one-quart oil container, rigidly mounted, which is connected to the router head by a piece of flexible tubing. The container is equipped with an oil adjustment valve. Pressure is supplied by a compressed air line which attaches to an air pressure regulator valve and an automatic cut-off valve which are mounted to the oil container with rigid tubing.



Prior to the adoption of Holcombe's development, standard practice was to apply cutting oil with a brush to the work being routed rather than to the cutter.

starting from scratch
WITH MARSHALL PRECISION GROUND FLAT STOCK
The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.
★ WATERcrat: A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.
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★ AIRcrat: This air-hardening tool steel shows less size change and offers a greater safety in hardening than either of the other grades. Dept. TD.
Write for descriptive literature, catalog of sizes and prices.
MARSHALL STEEL CO.
LA GRANGE, ILLINOIS
The Aristocrats of Ground Tool Steel

SEE ADVERTISERS INDEX. PAGE 137. FOR KEY NUMBERS

Million Handicapped Workers Still Available

Utilization of the vast reservoir of handicapped persons in defense production jobs as a bulwark against increasing manpower shortages was brought to industry's attention in the recent campaign by the President's Committee on National Employ the Physically Handicapped Week.

The Department of Labor estimates there are 700,000 physically handicapped persons in the nation's working force, and that 1,000,000 such persons now unemployed can be added to the national work-force if given equal footing with unimpaired applicants for jobs.

Labor Secretary Maurice J. Tobin recalled that more than 2,000,000 placements of handicapped persons have been made by the U. S. Employment Service over the last 10 years.

"Properly placed," Secretary Tobin declared, "handicapped workers will meet the test, whether in the shop, the office, the laboratory, or on the farm."

"Those who are not employed should be given the right to take their places in the common effort to build up the strength of the nation."

Impetus for the drive was provided by President Truman several months ago. In a letter to the committee chairman, the President said:

"In our nation's physically handicapped lies a vast reservoir of relatively untapped skills.

These skills, properly utilized, constitute a mighty bulwark against the present threat of manpower shortages. They must not be overlooked in our preparedness program.

"Qualified handicapped workers not now employed should be employed. Those not trained should be trained, screened for maximum usefulness, and given the opportunity to contribute their skills and abilities.

"The manpower challenge that we face can be met. It must be met, if we are to survive as a nation and preserve the peace of the world."

Trimming Formed Parts
AND HUNDREDS OF OTHER
CUTTING JOBS are FRICTION SAWN
QUICKER and BETTER
with Tannewitz
HIGH SPEED BAND SAWS!

Friction sawing with Tannewitz High Speed Band Saws is much faster, easier and better than any other method of cutting formed parts, flat sheets of either soft or hard steel, non-ferrous metals, glass, plastics and many other materials. Down-drag of saw is so little that no rest of any kind is needed in trimming formed parts or castings. Savings in time and costs are immense.

Get your FREE COPY OF "FRICTION SAWING"

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

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Stud Sets

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Strap Clamps

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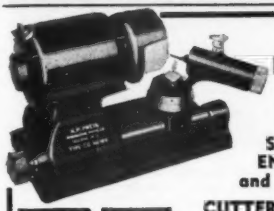
SURE GRIP STEP BLOCKS

TIETZMANN TOOL CORP.
315 N. Main St., Englewood, Ohio



THE FAMOUS PREIS-PANTO

SINGLE-LIP ENGRAVING and ROUTING CUTTER GRINDER

PANTO

Write for details

H. P. PREIS ENGRAVING MACHINE CO.
647 Route 29 Hillside, N. J.

HAND TAPPING with MACHINE PRECISION

Adapts for LATHE USE

59.50 F. O. B. ST. PAUL

Just slip a tap adapter into the Dahlstrom Tap Guide and twist. Your hand tapping will be quick and accurate. For machine tapping, the spindle top is center-bored to fit the tail stock center of a lathe. Size 13"x8"x14". Includes 9 adapters (5/32 to 3/4"). Taps not furnished. Dahlstrom Mfg. Co., 2508 W. Larpenteur, St. Paul 8, Minn. Write for Pamphlet.

Dahlstrom **TAP GUIDE**

Peaslee

ENGRAVERS' CUTTERS

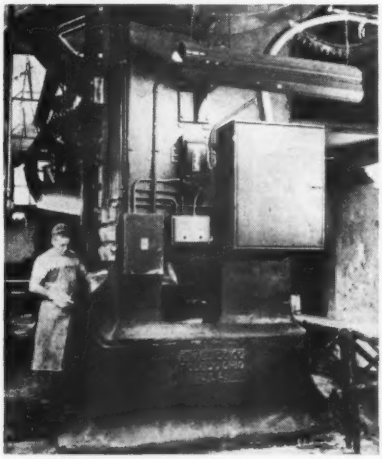
HIGH QUALITY
LOW COST
IMMEDIATE DELIVERY
WRITE FOR BULLETIN R-10

PANTOGRAPHS
DUPLICATORS
DIE SINKERS
MILLING MACHINES

PEASLEE METAL PRODUCTS CO. East Hartford, Connecticut

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

New 900-ton Bliss Press Speeds Television Tube Production at RCA



To keep abreast of television tube demands, RCA Victor Division, Camden, N. J. recently completed installation of this 900-ton Bliss No. 314 press, one of the larger type commercial metal-forming machines. Stainless steel blanks, first spun into round form, are placed in the huge press to form the familiar rectangular TV cones picture below. Tube cones are later sized in a drop hammer press; undergo a hole piercing operation; and then have their sides trimmed. After a caustic wash, they are ready for shipment from the RCA Victor Plant in Camden, N. J. to the company's tube manufacturing plants for final tube assembly operations.

Controlling Machine Tool Fires

If pressurized fire extinguisher protection is within easy reach of a machine operator, hazard to machine tools like this Greenlee automatic can be eliminated. This particular screw machine fire, which had gained one minute headway, was extinguished in 1½ seconds when a portable extinguisher was

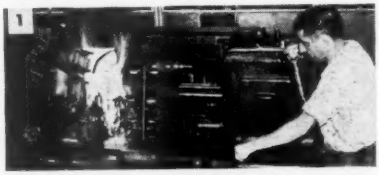


Fig. 1. In this screw machine fire, a substantial chip blaze given a one minute headway, was extinguished in split seconds.

brought into action. The extinguisher is attached directly to the screw machine and can be detached and operated by one hand, leaving one hand free. The extinguisher utilized fast acting CBM (chlorobromomethane) under 150 psi for this almost instantaneous control of what might have been a costly fire.

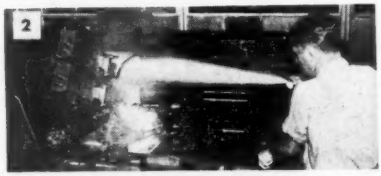
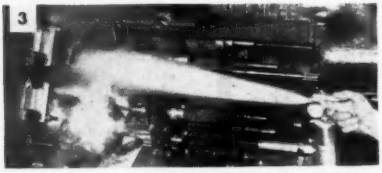


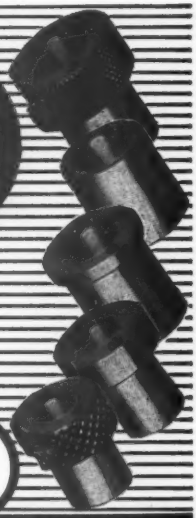
Fig. 2. The easy one-hand operation of the extinguisher leaves the machine operator's left hand free to stop the screw machine.



Photos courtesy Stop-Fire, Inc.

Fig. 3. In 1½ seconds the CBM has killed the flames completely.

YOUR
"SPECIAL BUSHINGS"
May Be Our Regular
STOCK ITEMS!



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Accurate Interchangable Concentric

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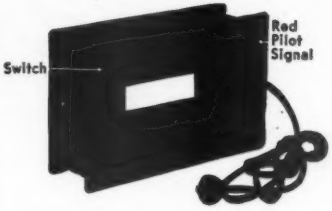
THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

Save TOOLS · TIME · LABOR
with the Improved · AMC ·
DEMAGNETIZER



No shop or toolroom can afford to be without one. Thoroughness of the AMC Demagnetiser will give greater precision to finished parts.

One pass through AMC Demagnetiser removes all magnetism from processed parts. Large flat surfaces are demagnetised by sliding unit over surfaces.

● Our AMC Demagnetizer will pay for itself in a few weeks. Standard units available.

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ALOFS MFG. CO.
1619 Madison Grand Rapids, Mich.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Circle postage-free Inform-A-Gram Key Number for your request.

"Chucks and Their Uses" is a new, profusely illustrated, 68-page booklet published by The Skinner Chuck Co. Photos and drawings show all types of standard and many special chucks. A full description is given of each type, covering details of construction, use, mounting, etc. There are also chapters on the care of chucks, lubrication and cleaning, and safety measures. THE SKINNER CHUCK CO., 344 Church St., New Britain, Conn., will honor all requests.
Circle Inform-A-Gram No. C1.

Aid to Better Arc Welds. A new pocket-size booklet, "Hobart Welding Electrodes and Weldors' Vest Pocket Guide," contains much useful arc welding information. It discusses metals and electrodes, types of electrodes, the four essentials of proper welding procedures, color marking for identification of electrodes, types of joints, typical positions, standard steel shapes, characteristics of the fillet weld, causes of common welding troubles and average electrode consumption. Complete instructions are given for using all Hobart Electrodes. Write to THE HOBART BROS. CO., Box EW-161S, Troy, Ohio.
Inform-A-Gram No. C2.

A Valuable New Tool Maintenance Guide is now available in the form of Carborundum's Booklet No. 10, entitled "Maintenance of Alloy and High Speed Cutting Tools." Here is a well illustrated, 70-page booklet (pocket-size) that covers lathe and planer tool grinding, grinding of cutters and reamers by various means, grading recommendations, coated abrasives, tool room sticks and many other subjects. THE CARBORUNDUM CO., Dept. T&P, Niagara Falls, N. Y.
Circle Inform-A-Gram No. C3.

Twenty-Four Pages of Handy Tapping Data comprise the latest publication of Standard Tool Co. This booklet covers tap and thread terms, selection and operation of taps, suggested tapping speeds, suggested lubricants for tapping, pitch diameter of nuts and tapped holes, pitch diameter limits of standard hand taps, suggested tap sizes for producing various classes of fits, sizes of taps and tapped holes, lead, recommended wire sizes, American Standard Pipe Threads and other subjects. Also included is an illustrated chart explaining tap terminology. Address STANDARD TOOL CO., 3950 Chester Ave., Cleveland 14, Ohio.
Inform-A-Gram No. C4.

"Basic Facts About Materials Handling," the newest Clark Equipment Co. booklet, discusses efficient handling of raw and finished materials, their proper storage, and how modern materials handling machines can expedite manufacture to cut costs and save time and money. It tells how to combine small units into big ones for more efficient handling, how to route materials, how to utilize "overhead" space for storage, and how to make the best use of a limited manpower force. CLARK EQUIPMENT CO., Industrial Truck Div., Dept. T&P, Battle Creek 62, Mich.
Circle Inform-A-Gram No. C5.

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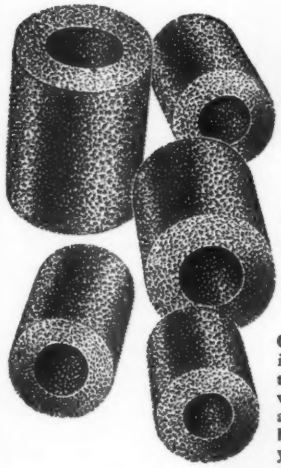

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Bending Techniques are highlighted in a new bi-monthly news bulletin. "Pines Engineering News" features bending and end-finishing techniques, provides tooling data on outstanding jobs, up-to-date details on new developments and bending applications, and helpful facts concerning short-cut production methods. To get your name put on the mailing list, write PINES ENGINEERING CO., INC., 601 Walnut St., Aurora, Ill.
Circle Inform-A-Gram No. C6.

Coated Abrasive Case Histories are shown in a cleverly-done mailing piece from Behr-Manning. The six interesting case histories are printed as individual folders and are inserted in a larger file folder. Write to BEHR-MANNING CORP., Dept. T&P, Troy, N. Y.
Circle Inform-A-Gram No. C7.

Easy-to-Follow Instructions on brazing sheet and cast aluminum are contained in a folder from All-State. This four-pager is of especial importance to the return of women to war plants since it reflects the ease with which novices can acquire skill in fabricating even thin aluminum with the special alloys developed since World War II. Address ALL-STATE WELDING ALLOYS CO., INC., 273 Ferris Ave., White Plains, N. Y.
Circle Inform-A-Gram No. C8.

Sixty-Six Hints to simplify design and reduce spring costs are given in Newcomb's eight-page Bulletin NS 500. Specific hints are given on purchasing, materials, finishes, gages etc. THE NEWCOMB SPRING CORP., 3902 Seventh Ave., Brooklyn 32, N. Y.
Circle Inform-A-Gram No. C9.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

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As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

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WRITE FOR LATEST CATALOG NO. 10.

THE WELDON TOOL CO. Cleveland 4, Ohio

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The New Shell-Molding Process is fully described in a brochure recently published by The Borden Co. This process is expected to enable the foundry industry to recapture much work that it has lost to forgings, weldments and other types of metal fabrication. The brochure gives information on what equipment and material to use in shell-molding, specifies the proper temperatures and explains how possible pitfalls can be avoided. THE BORDEN CO., Chemical Div., 350 Madison Ave., New York 17, N. Y., will honor all requests for this brochure.
Inform-A-Gram No. C10.

Practical Ways to Prevent Industrial Accidents and fires are described in a new edition of the National Safety Council's 800-page "Accident Prevention Manual for Industrial Operations." Just off the press, it contains 256 more pages and 11 more sections than the first edition. Detailed description and price can be obtained from the NATIONAL SAFETY COUNCIL, 425 N. Michigan Ave., Chicago 11, Ill.
Inform-A-Gram No. C11.

Helpful Tips on Regrinding. the use of soluble oils and special cutters are "bonus" features of DoALL's new Milling Tool Catalog, No. 51-806. Standard catalog information is listed for milling cutters, slitting saws, end mills, shell end mills, keyseat cutters and T-slot cutters. This 12-page catalog is well illustrated. Send requests to THE DoALL CO., 254 N. Laurel Ave., Des Plaines, Ill.
Circle Inform-A-Gram No. C12.

"Grinding Fluids—Their Characteristics and Applications" is typical of the informative, interesting articles appearing regularly in Norton's "Grits and Grinds" publication. To get on the mailing list, write NORTON CO., 1 New Bond St., Worcester 6, Mass.
Circle Inform-A-Gram No. C13.

New Welding Alloys Chart. Eutectic has issued a handy new chart of Low Temperature Welding Alloys, measuring 10" x 14", suitable for wall hanging or purchasing department files. It contains detailed specifications on nearly 200 metal-joining alloys including bonding temperatures, tensile strengths and recommended uses. Major listings show proper welding alloys for use with various types of steel and other metals. Write to EUTECTIC WELDING ALLOYS CORP., Dept. "P," 172nd St. & Northern Blvd., Flushing, N. Y., for this new chart.
Inform-A-Gram No. C14.

"Power Press Protection" is a detailed treatise on this important subject. It was written by John I. Junkin and is offered in booklet form by Junkin Safety Appliance Co., Inc. It covers the general problem, press maintenance, feeding methods, safety guards, inspection and supervision, operating personnel and several other topics. Address requests to JUNKIN SAFETY APPLIANCE CO., INC., Tenth & Hill Sts., Louisville, Ky.
Inform-A-Gram No. C15.

Alloy Steel Tubing Data. Assistance in solving problems involving the use of alternate grades of low carbon, or carburizing grades of tubing steels, is offered in new B&W Bulletin TDC 194. It presents condensed data on microstructure, critical points, effect of alloy elements, etc. THE BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa.
Circle Inform-A-Gram No. C16.

"First Aid for Pliers" has been issued by Utica Drop Forge & Tool Corp. This colorfully illustrated booklet discusses common ailments and their remedies, placing particular stress on the chief enemy of pliers—rust. Write to UTICA DROP FORGE & TOOL CORP., Dept. T&P, Utica 4, N. Y.
Circle Inform-A-Gram No. C17.

FOR DETAIL MARKING OF NAME PLATES CAN BE USED ON WOOD, PLASTICS, ETC.

Now there is a new labor-saving device — one that will really save many dollars. It's the AUTOMARK Electric Metal Marking Typewriter. Its uses are almost limitless where metal marking, once a slow tedious operation, can now be accomplished in one-fifth the time formerly required. The AUTOMARK has been perfected for the detail marking of name plates — no levers to pull — no dials to spin—it's all-electric, with automatic table feed. It actually will reduce the cost of production dollars five times by its speed. Strong enough to mark on steel up to ½" thick, yet can be adjusted to mark on wood or plastics. Simple to operate, it has a letter wheel made from high grade alloy tool steel. Type sizes interchangeable—1/32" to ¼" — any size wheel can be inserted quickly, easily.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Productivity, from page 118

tive of the medium carbon alloy steels in general.

The photomicrographs in Figures 22 through 26 show the structures of the steels investigated.

Figure 22 shows a 75% pearlite, 25% ferrite structure obtained by an annealing process.

Figure 23 shows a spherodized structure while Figure 24 shows a Widmanstatten structure. The Widmanstatten

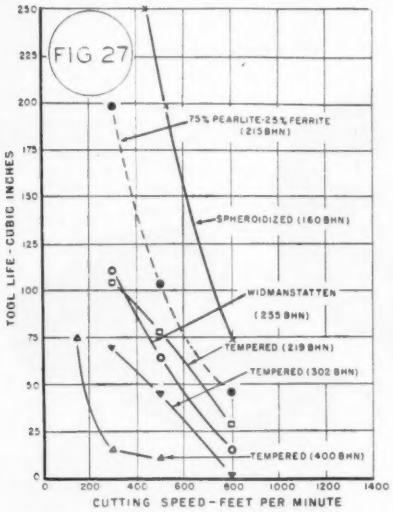


Fig. 27. TOOL LIFE IN CUBIC INCHES, METAL REMOVED, TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Tool: 78B carbide; 0° back rake; 6° side rake; 0° side cutting edge angle; 6° end cutting edge angle; 6° relief; .020" nose radius.

was obtained by an air cool following a steel rolling from approximately 2100°F.

Figures 25 and 26 show quenched and tempered Martensite structures obtained by tempering to 300 and 400 Bhm respectively.

These steels were turned on a lathe with both high speed steel and carbide tools. The tool life results with the carbide tooling indicate first of all a marked dependence of tool life on microstructure, and, secondly, a marked dependence of tool life on grade of carbide.

(Continued on page 162)

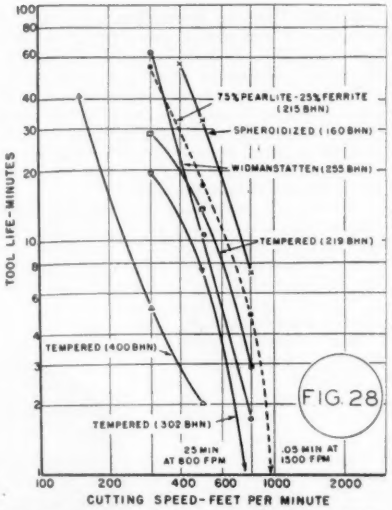
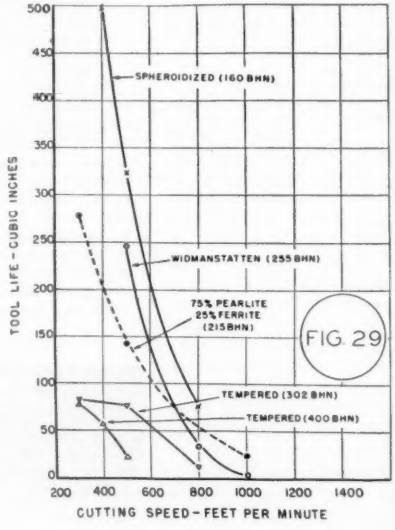

TOOL LIFE - MINUTES
CUTTING SPEED - FEET PER MINUTE
75% PEARLITE - 25% FERRITE (215 BHN)
SPHEROIDIZED (160 BHN)
WIDMANSTATTEN (255 BHN)
TEMPERED (219 BHN)
TEMPERED (400 BHN)
TEMPERED (302 BHN)
FIG. 28
.25 MIN AT 800 FPM
.05 MIN AT 1500 FPM

Fig. 28. TOOL LIFE IN MINUTES TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Same data as those of Figure 27, but with tool life plotted in terms of time on logarithmic co-ordinates.

Fig. 29. TOOL LIFE IN CUBIC INCHES, METAL REMOVED, TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Grade 78 carbide tool. All other conditions of tool and cut same as those of Figure 27.



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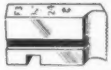

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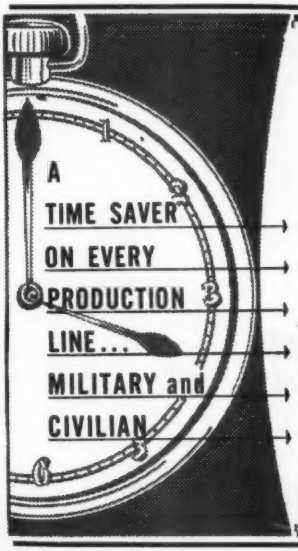

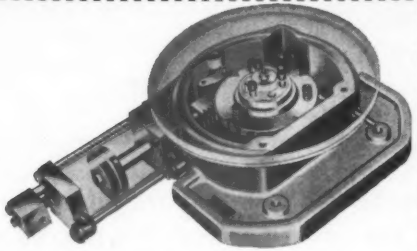

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Plant Lighting, from page 110

Over-voltage operation will result in higher wattage, higher efficiency and higher light output. But it also shortens lamp life materially. Under-voltage burning causes a reduction in wattage, in efficiency, and in light output, while increasing the lamp life. A voltage drop of as little as five percent below normal results in a loss of light amounting to more than 16 percent. This same drop in voltage provides a saving in wattage of only eight percent. Since lamp cost is always small in comparison with the cost of power to operate the lamp, the increased lamp life which accompanies reduced voltage does not begin to compensate economically for the loss in light output.

The voltage applied to fluorescent luminaires should be kept well within the operating range of the ballasts. For normal supply voltages, this range is from 110 to 125 volts, or 118 volts average. Low voltage as well as high voltage reduces efficiency and shortens lamp life. Low voltage may also cause instability in the arc, while over-voltage results in excessive operating current and may overheat the ballast, and cause lamp failure.

The life of a fluorescent lamp is affected not only by the voltage and current supplied to it, but also by the number of times it is started. Electron emission material is "sputtered" off from the electrodes continuously during the operation of the lamp, and in particularly large quantities each time the lamp starts. The normal end of life is reached when the emission material from either of the two electrodes is used up. Therefore, the greater the number of burning hours per start, the longer the life of the lamp will be. For example, rated average life of a 100-watt T-17 60 inch lamp is 2500 hours when operated three hours per start, 4500 hours at six hours per start, and 6500 hours at twelve hours per start.

Maintenance of fluorescent lighting systems, particularly in office areas where units are ceiling mounted, is usually performed by a team

of two to four men equipped with the necessary ladders and cleaning tanks. One man on the ladder removes the lamps and reflectors or louvers, and passes them to the men on the floor for cleaning. Lamps are wiped with a wet cloth, while louvers are dipped in a long tank containing water and a soapless powder detergent, after which they are put back in the luminaire while still wet. Reflectors are washed, dried, and reinstalled.

Cleaning Louvers

Until recently, it took about 15 minutes for a maintenance crew to properly clean a single four-lamp louver type luminaire. The major portion of this time was spent in cleaning the egg crate louver. Many different detergents were tried, in an effort to find something which would reduce this cleaning time, but with little or no success. Then a substance called Alcono, used successfully for cleaning chemical glassware, was recommended. A shallow 40-gallon tank was constructed, and Alcono was added to the tank of water in accordance with the directions on the box. This worked fine. The louver was slushed in the solution for one-half minute, removed, excess water was shaken off, and the louver reinstalled while it was still wet. Cleaning time was cut from 15 to two minutes per luminaire.

An aftermath of the first cleaning with Alcono was that two weeks later the louvers changed color to a dirty brown—a result of too strong a solution. Through experiment, a ratio of one pound of Alcono to 40 gallons of water was finally selected as proper for cleaning louvers. Cleaning time is now five minutes per luminaire as compared with the previous time of 15 minutes. The savings involved are well worth the time spent on planning such maintenance. In one building alone, containing 2650 luminaires, cleaning time for one crew was reduced from 660 to 220 hours.

Two major problems exist in the maintenance of fluorescent lighting systems, which can be solved easily. First, is the problem of "flickering" in the tubes. This trouble is two-fold; 1) it disturbs

(Continued on page 165)

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. . . Productivity, from page 158

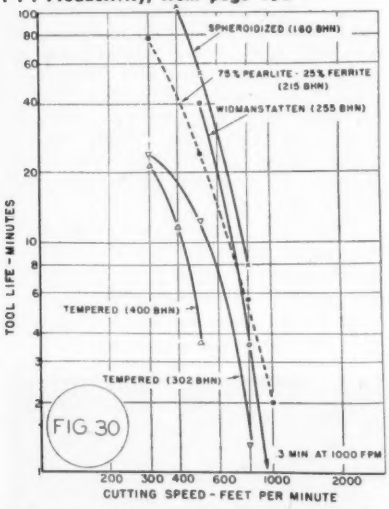

SPHEROIDIZED (180 BHN)
75% PEARLITE - 25% FERRITE (215 BHN)
WIDMANSTATTEN (255 BHN)
TEMPERED (400 BHN)
TEMPERED (302 BHN)
3 MIN AT 1000 FPM
FIG 30
TOOL LIFE - MINUTES
CUTTING SPEED - FEET PER MINUTE

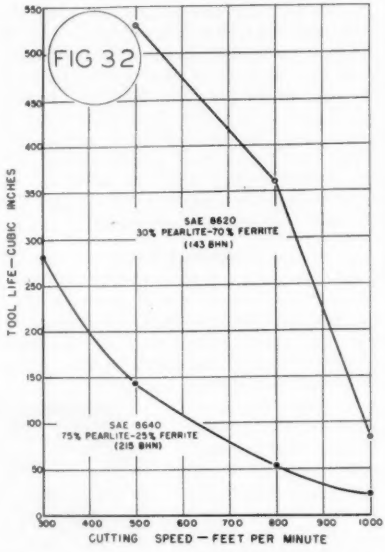
Fig. 30. TOOL LIFE IN MINUTES TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Turning SAE Steel. Same data as those of Figure 29, but with tool life plotted in terms of time on logarithmic co-ordinates.

The tool life versus cutting speed curves for the general purpose grade of steel cutting carbide 78B are shown in Figures 27 and 28.

With this grade of carbide the tool life appeared to be proportional to the hardness with the exception of the tempered 219 Brinell structure, which although as soft as the annealed structure, machined far poorer. Thus at 300 feet per minute the annealed structure consisting of 75% pearlite—25% ferrite, provided twice the tool life as the tempered.

The tool life obtained in turning with the harder grade of steel cutting carbide (Grade 78) is shown in Figures 29 and 30. With this carbide the Widmanstat-

(Continued on page 166)



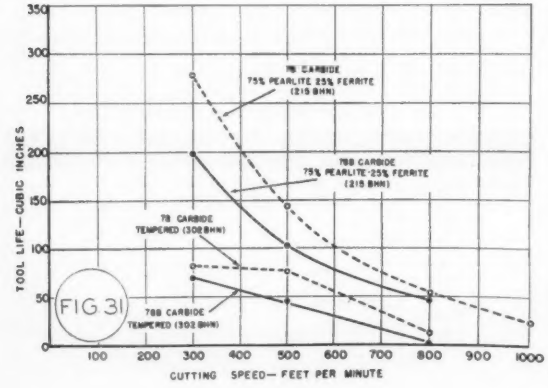


Fig. 31. Left. TOOL LIFE IN CUBIC INCHES, METAL REMOVED, TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Comparison of 78 and 78B Carbides. Same tool angles and cut conditions as those of Figure 27.

Fig. 32. Above. TOOL LIFE IN CUBIC INCHES, METAL REMOVED, TO PRODUCE .015" WEAR ON CARBIDE TOOL VERSUS CUTTING SPEED. Comparison in Turning Between SAE 8640 and SAE 8620. Grade 78 carbide in tool. Same tool angles and cut conditions as those of Figure 27.

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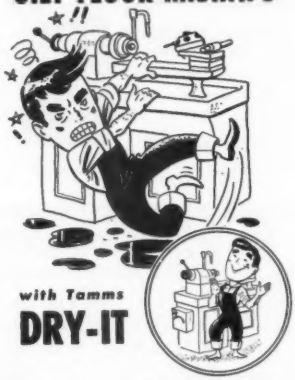

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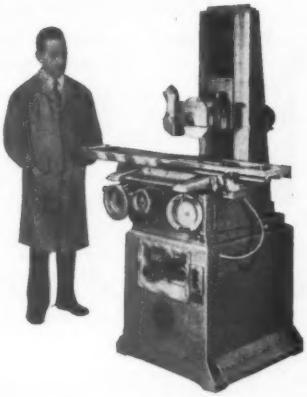

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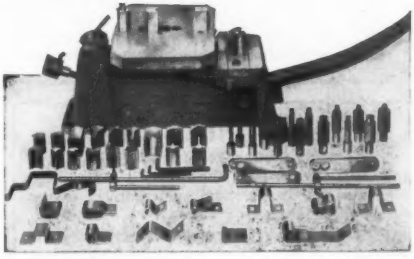

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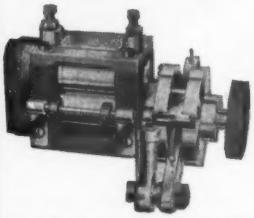

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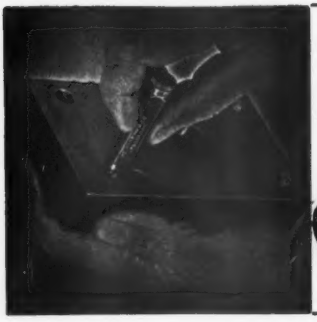

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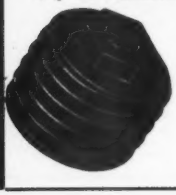

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. . . Plant Lighting, from page 161

employees; 2) it creates a problem of burning out the ballast, due to heating the ballast with the excessive current which exists in a ballast when it is trying to "start" a lamp. This "flickering" can be entirely eliminated by using no-blink starters, which automatically cut off the offending lamp if the current is excessive for any reason.

The second major problem relates to plastic louvers. When plastic louver luminaires are first installed, all goes well until the first cleaning. During the first cleaning, if soap and water is used and the louvers are dried with a cloth, the louvers will be as dirty after about two weeks as they should be after four months. Reason is that drying of the louvers loads them with static electricity which causes dirt to be attracted to the surfaces. Solution to this problem is to use a soapless powder solution—Dreft is used by Westinghouse — then rinse in a clean water bath and reinstall the louvers while still wet.

Plans for the Third Plant Maintenance Conference, to be held concurrently with the Plant Maintenance Show at Convention Hall, Philadelphia, Jan. 14-17, call for an intensive examination of maintenance problems. Thirty-four separate discussions will be conducted. More than 100 experts, drawn from industrial firms all over the country, will lead the panel. Ten thousand maintenance executives are expected at the show and conference. General topics include "Maintenance Costs" and "Inspection Methods and Records for Preventive Maintenance."

Scrap for Steel Mills

Aimed to help increase the current dangerously low iron and steel scrap inventories in this country, a booklet, "Scrap for Steel Mills and Foundries for Defense," is now being distributed by the National Production Authority, U. S. Department of Commerce.

The booklet outlines a program for the recovery of dormant scrap and emphasizes that record-breaking steel production and large scale expansion of production capacity have reduced scrap inventories to a new all-time low, with some plants having only a few days scrap supply on hand.

Copies of the booklet can be obtained from any Department of Commerce Field Office. Local Scrap Mobilization Committees, organized in over 800 cities, can provide further information on the campaign.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Productivity, from page 162

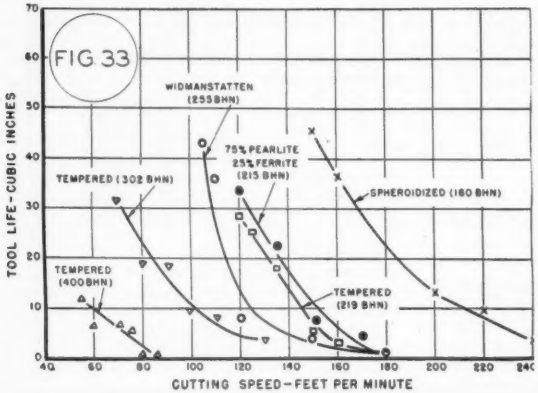


Fig. 33. Left. TOOL LIFE IN CUBIC INCHES, METAL REMOVED, TO PRODUCE BREAK DOWN OF TOOL NOSE ON HIGH SPEED TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Tool: High Speed steel (18-4-1); 0° back rake; 15° side rake; 0° side edge cutting angle; 5° end cutting edge angle; 5° relief, .015" nose radius. Cut Conditions: .100" depth; .010" per revolution feed. Cutting Fluid: Soluable oil solution (20:1). Fig. 34. Below. TOOL LIFE IN MINUTES TO PRODUCE BREAK DOWN OF NOSE ON HIGH SPEED STEEL TOOL VERSUS CUTTING SPEED. Turning SAE 8640 Steel. Same data as those of Figure 33, but with tool life plotted in terms of time on logarithmic co-ordinates.

ten structure machined better than the 75% pearlite—25% ferrite structure in spite of the fact that the former was 40 points harder than the latter (225 vs 215 Bhn).

Thus hardness cannot be used as the sole criterion, but instead should be used as one of the guides in setting up machining conditions.

Particular attention should be paid to the fact that it is possible to choose an annealed structure and a guide of carbide which will permit machining at much higher speeds than are encountered in present practice.

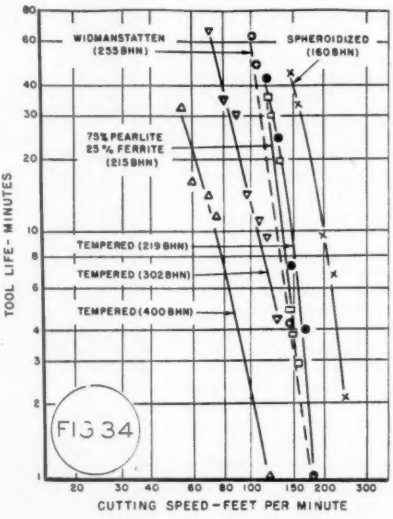
The cutting properties of the lower carbon steels such as SAE 8620 are superior to those of SAE 8640 and hence even higher speeds are therefore possible.

Figure 32 compares the tool life characteristics of an annealed 8620 and 8640 when turned with grade 78 carbide. It is observed that high tool life is obtainable even at speeds up to 800 and 900 feet per minute. As a matter of fact, such speeds are being used in turning an automobile hypoid pinion as will be described later.

It should again be emphasized that, on production set-ups that are run week after week on the same operation, it is imperative that data be obtained relating the machining properties to the work material and structure. Without such information it is impossible to set the optimum machining conditions.

The machining properties of the 8640 forms of steel when turned with 18-4-1 high speed steel tools are given in Figures 33 and 34. These are the results of a turning test taking a cut 1/16" deep at .010" feed using a water soluble cutting fluid. The tool life end point here was the complete failure of the nose

(Continued on page 170)



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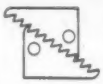

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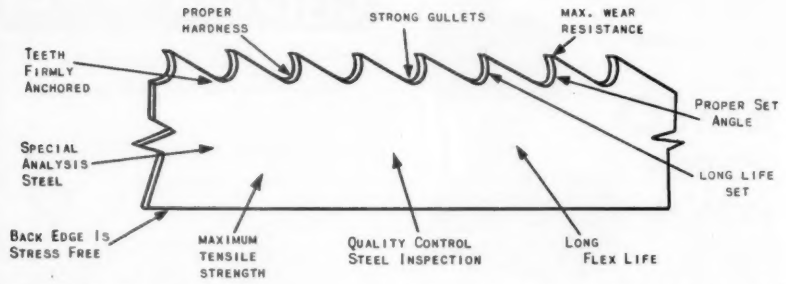
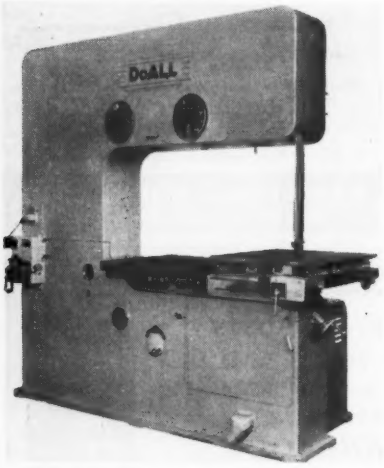
New Saw Band for Friction Sawing



Photos courtesty The DoALL Co.



The technique of friction sawing entails ultra high saw velocities up to 15,000 feet per minute. At such speeds the material being cut is brought to the softening point through friction created between the cutting edge of the blade and the work. On ferrous materials this point of plasticity is approximately the forging temperature of the metal. As the material is fed into the saw it becomes soft and is removed from the kerf by the teeth of the high velocity blade.

This process is one of high productivity, and unit production cost is but a fraction of other methods. This is especially true on material work thickness ½" and under. For example, $\frac{1}{16}$" thick stainless steel may be cut at the high rate of 1200 linear inches per minute. Typical applications are castings, sheet metal fabrication, tubing, armor plate, high speed cut-off work, and general shaping of ferrous material with work thickness ranging up to one inch.

A prerequisite for friction sawing is long flex life rather than tooth sharpness, whereas in conventional low-speed sawing tooth sharpness is the major factor. Therefore, friction bands are not recommended for low-speed conventional type sawing.

A new saw band specifically designed for high-speed friction sawing has been introduced after eighteen months of testing on production applications in selected companies.

Through the use of a special heat treating process, its teeth are permanently anchored and locked in place. The metallurgical characteristics of the band enable maximum flexation, resulting in long, uninterrupted production sawing.

The saw band is offered in three widths, ½", ¾" and 1", 10 or 14 teeth per inch, and is available in either 500' coils or custom welded cut lengths.

Ace Abrasive Laboratories, New York City, manufacturers of "Star-Dust" diamond powders and compounds, has expanded its Engineering Service Department to take care of the increasing number of requests for information on the correct use of abrasive materials, according to an announcement by Benjamin Greenfield, president.

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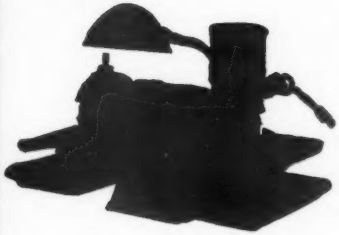

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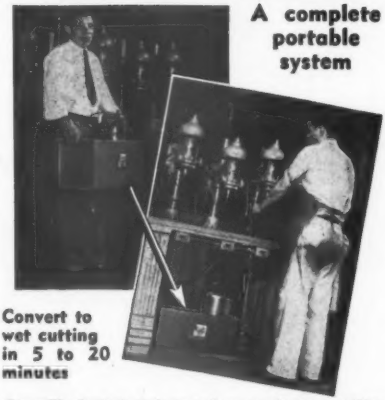

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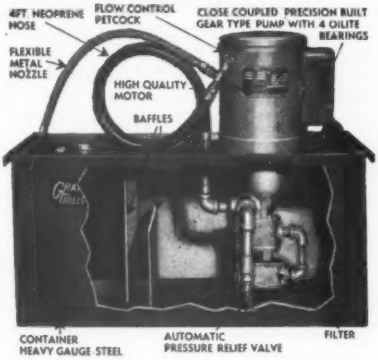

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Productivity, from page 166

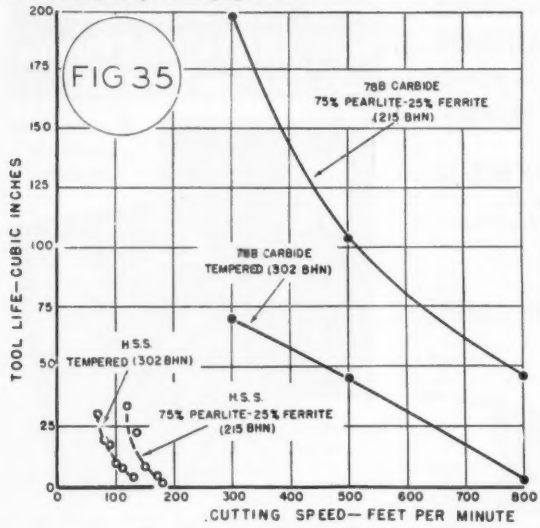

Fig. 35. TOOL LIFE IN CUBIC INCHES VERSUS CUTTING SPEED. Comparison in Turning of SAE 8640 Steel Between High Speed Steel and Carbide Tools. For high speed steel tool, the tool life end point was complete nose break down. For carbide, the tool life end point was .015" wear. The tool angles and cut conditions for the carbide and high speed steel tools were same as those of Figures 27 and 33, respectively.

radius and thus represents complete tool destruction.

It is observed from the charts that the tool life when using the high speed steel was inversely proportional to the Brinell hardness. The spherodized structure was observed to provide the longest tool life, which is in line with previous investigations which indicate a spherodized structure provides longer tool life than any other type of annealed steel structure when machined with high speed steel tools.

This is contrast with results obtained when machining with carbide tools where no particular advantage was observed by spherodizing.

The enormous increase in cutting speed and tool life possible by conversion from high speed steel to carbide tooling is illustrated in the results on machining a tempered and annealed form of 8640 steel, Figure 35.

On this chart it must be recalled that the high speed steel tool was run to destruction, whereas, the carbide tools were removed after .015" carbide flank wear. Ordinarily, the carbide tools could be run to .030" flank wear, which would shift the carbide curves far to the right.

The increase in production that accompanies the higher speed and tool life obtainable by conversion from high speed steel to carbides is of the order of 6 to 10 times.

ACKNOWLEDGEMENTS

The charts presented in this paper were prepared by the authors' company for the United States Air Force under a subcontract from the Curtiss-Wright Corporation. All charts except those of Figures 32, 33 and 35 appeared previously in the "United States Air Force Machinability Report, 1950".

★ ★ ★

The Formation of a New Company to be known as Norton Behr-Manning Overseas, Incorporated, has been announced by Norton Co., Worcester, Mass., and Behr-Manning Corp., Troy, N. Y. The new company will handle all of the export business and direct the subsidiary plant operations of these two corporations throughout the world. Headquarters will be in Worcester with branch offices located in New Rochelle, N. Y., and New York City.

Norton and Behr-Manning subsidiary plants are located in Australia, Canada, England, France, Germany, Italy and South Africa.

Heading the new firm are Herbert A. Stanton, president, and A. Donald Kelso, executive vice president and general manager.

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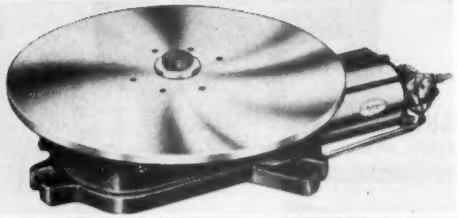

A New Heavy Duty Dial Feed Table (Model BRET-22) announced by Bellows, can be set to position 4, 6, 9, 12, 18 or 36 stations. This electrically controlled, air-powered rotary work feeder has a 22" dia. table top. The table will position quickly and accurately loads up to 1000 lbs. For additional details, write to THE BELLOWS CO., Box 631, Akron, Ohio.

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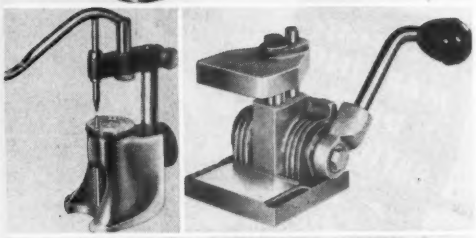

The Metalix Micro Press (outside cut) is a small, highly versatile press for light duty precision operation in staking, punching, piercing, reaming, broaching, marking, forming and riveting. Tools are guided by an adjustable cross arm mounted on a tool steel column. A hardened, ground and lapped tool steel guide bushing in the cross arm insures continuous positive tool alignment. Address METALIX MFG. CO., 26 Fitch St., Norwalk, Conn., for further data.

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Esco Mijit B-6 Single-Post Drill Jig (inside cut) combines small-size economy with accurate alignment and "touch-release" locking. It is recommended for drilling small parts and for short and medium size runs, where more costly fixtures and tooling cannot be justified. It provides an infinite number of locking positions, due to its patented cam action. ESCO ENGINEERING CORP., 1940 E. Woodbridge, Detroit 7, Mich.

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WALLEX is a new hard facing rod that has been laboratory and field tested by Wall Colmonoy during the past two years. This oxy-acetylene rod for abrasion resistance has good impact and corrosion resisting properties and possesses excellent weldability. WALL COLMONOY CORP., 19345 John R St., Detroit 3, Mich.

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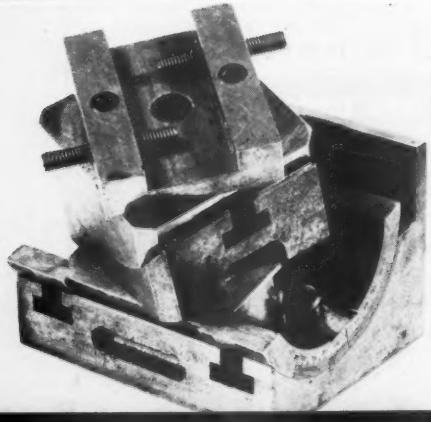

A Time-Saving Universal Vise for grinding compound angles has been placed on the market by Combination Vise and Jig Co. With this vise, any compound angle can be ground without guesswork and without the use of angle parallels. No mathematical computations or books or charts are necessary for the efficient use of this device. When the vise is used as a holder to hold the tools while being sharpened or made, considerable time is saved over the old method of free-hand grinding. Address COMBINATION VISE AND JIG CO., Dept. T&P, Orfordville, Wis.

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A New Peg Rack Truck (inside cut), built by Lloyd Engineering Co., allows movement of armatures, rotors, gears and other parts carefully from one operation to another in production. In transit, the parts, hung on cushioned racks inclined at 15° angle, are separated from each other to protect against damage by banging each other. LLOYD ENGINEERING CO., 59 Stephen St., Belleville 9, N. J.

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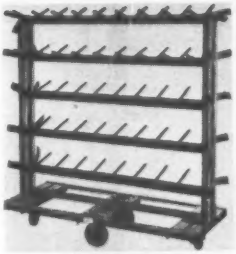

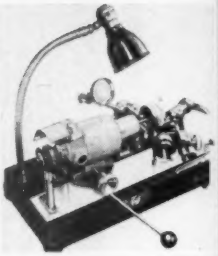

The New Dumore Drill Grinder (outside cut) is applicable to 2-lip twist drills, from No. 70 to ¼", either straight or tapered shank. Untrained help can grind drills right, the first time, with this new tool. The user can quickly and accurately obtain any included angle of drill point from 90 to 160°, and any clearance angle from 5 to 15°. Setup is fast and positive. THE DUMORE CO., Dept. T&P, Racine, Wis., will provide a detailed, illustrated bulletin.

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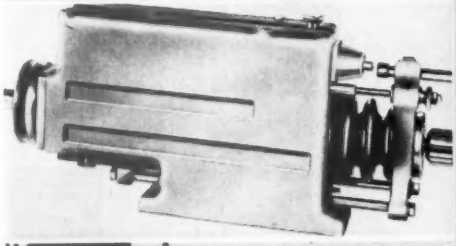
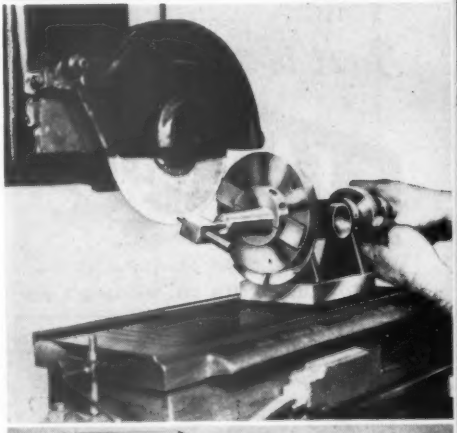


Two New Drilling and Tapping Units are available from Locke Gage Co. The 4000 Series (illustrated) is a heavy duty model with self-contained power source. It is capable of drilling up to 5/16" dia. in alloy steel. The 4000 S-A Series is a light duty model that employs shop air for power against a 3" sq. in. piston surface. It can drill up to ¼" dia. in mild steel. Full details can be procured from LOCKE GAGE CO., 10232 Woodward Ave., Detroit 2, Mich.

Circle Inform-A-Gram No. A8.



The Last Word Wheel Dresser is a compact, rugged and precision-built unit which when mounted on a magnetic chuck can accurately dress any radius, concave or convex with angles tangent to radius. It can likewise be used for plain radius or angle dressing or any combination. Setup of the diamond head is rapid and simple. Write for full information to LAST WORD SALES CO., 18500 Mt. Elliott Ave., Detroit 34, Mich.

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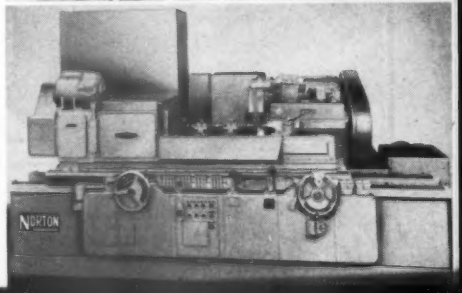
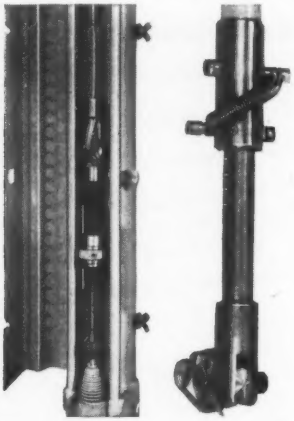
Norton Co. has developed for their No. 2 CAM-O-MATIC automatic hydraulic cam grinding machine arrangements by which the tapers required on some automotive cam contours are automatically produced at normal high production efficiency. Tapers in either direction, or in both directions on the same shaft, are speedily produced by these new patented arrangements. NORTON CO., 1 New Bond St., Worcester 6, Mass.

Circle Inform-A-Gram No. A10.



The Improved Possons Safety Device for punch press operators assures additional safety and ease of maintenance. The pull-back adjustment, which controls the location



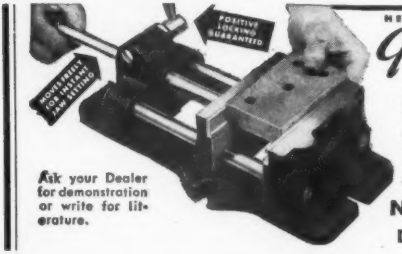
of the operators hands, can now be made while standing on the floor. This adjustment, consisting of a knurled nut on a 10" screw (left-hand illustration), takes care of both hands. At right are the new, solid pins for adjusting the ram connection rod. A third improvement, not shown, is an arrangement for hanging the hand straps on the face of the bolster plate when the operator leaves the press. THE POSITIVE SAFETY MFG. CO., 4411 Perkins Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No. A11.

A New, Large Push-Type Toggle Clamp is being produced by Wolverine Tool Co. for larger, heavier, fixtures. No. 132-A Clamp has a plunger 1" in dia. with a 2½" stroke. Ultimate load is 10,000 lbs. The ground plunger

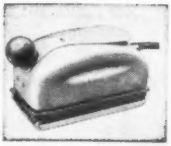
and broached guide hole permit accurate locating as well as clamping operations. WOLVERINE TOOL CO., 1486 E. Woodbridge, Detroit 7, Mich., will supply complete information.
Circle Inform-A-Gram No. A12.

First in
STAMPINGS
IN SMALL LOTS
(Short Runs)
Precision Die Made—Lowest Possible Cost
DAYTON ROGERS MFG. CO., Minneapolis 7, Minn.

HARDNESS TESTING
has been done with the
SCLEROSCOPE
since 1907
•
THE SHORE INSTRUMENT & MFG. CO., INC.
9025 Van Wyck Avenue
Jamaica 2, N. Y.



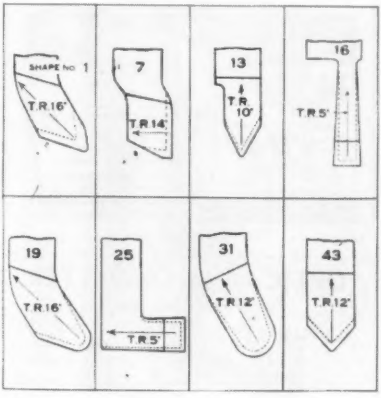
Ask your Dealer for demonstration or write for literature.
HEINRICH
Grip-Master
GRIPS WITH SPEED CUTS TOOLING COSTS
Step up drill press production with the Heinrich "Grip-Master" Screwless Vise—with the patented "Circle Grip" hammer blows cannot break. Work is automatically leveled; jaws set instantly, effortlessly. 3", 4", 6", 8" jaw widths; ideal as base structure for drill jigs and fixtures.
NATIONAL MACHINE TOOL CO.
DEPT. 131-L RACINE, WISCONSIN



A Pneumatic Reciprocating Sander is announced by the Detroit Surfacing Machine Co. The new model operates with a straight-line, reciprocating action that is highly desirable on many types of work as it permits sanding up to right angles and does not cut abrasive patterns. The unit is light in weight, weighing less than 6 lbs. A well designed grip provides for comfortable one-hand operation. This full-size sanding, rubbing and polishing machine takes one-third of a standard 9"x11" sheet of abrasive paper. For descriptive literature, write DETROIT SURFACING MACHINE CO., 1333 E. Eight Mile Rd., Detroit 20, Mich.

Circle Inform-A-Gram No. A13.

The New Line of Superweld Tools, available exclusively from A. Milne & Co., features solid high speed steel heads of equal section to the tool shanks. The high speed heads are joined to the shanks by electrical butt-welding. Distinct advantages of this line over ordinary tipped tools include longer service life and the ability to handle high speed and extremely heavy cutting loads. The fact that the high speed head is, in most cases, of equal

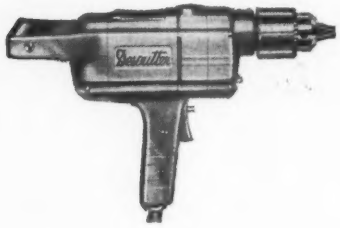


section to the shank, provides far more usable cutting steel than a tipped tool. It is even possible, when necessary, to change the shape of the tool by grinding. The eight illustrations give an indication of the wide range of 31 standard shapes in which Superweld tools are available. Write A. MILNE & CO., 745 Washington St., New York 14, N. Y., for complete details.

Circle Inform-A-Gram No. A14.

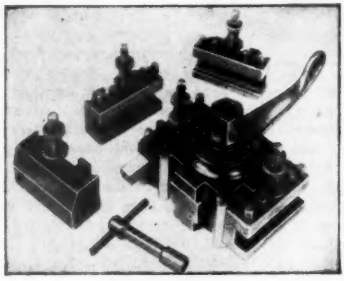
SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS
IMMEDIATE DELIVERY FROM STOCK
3AT, 3C
1A, 4C
5C
KLUTCH-KOLLET
Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.
480 (AC-50)
All collets in hexagon, square and round.
FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.
LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.
Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!
HAND DRAWBAR ½" cap.
LIVE CENTER (Ball Bearing) Double sealed for accuracy.
KASSON
Precision
KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!
GENERAL DIE AND STAMPING CO.
Integrity Since 1919
264 MOTT STREET • NEW YORK 12, N. Y.

New Portable Electric Drill. A two-speed gear box of completely new design permits the operator of this Desoutter drill to put through a small pilot hole first, then easily open out the hole with the larger drill. Effort normally required to drill ½" or ⅝" holes through steel is cut more than in half. Further details and literature on this heavy-duty drill can be had from NEWAGE INTERNATIONAL, INC., 235 E. 42nd St., New York 17, N. Y.



Circle Inform-A-Gram No. A15.

The "Dimco" Universal Tool Holder, for quick and accurate clamping on the lathe, is now available from Kelvin Systems Corp. Made in two sizes to fit any engine lathe, it permits the operator an unusual amount of flexibility and ease along with complete accuracy in interchanging multiple tool setups. More information, including complete specifications, is procurable by writing to KELVIN SYSTEMS CORP., 53 Water St., South Norwalk, Conn.



Circle Inform-A-Gram No. A16.

OCTAGONS, BILLETS AND FORGINGS FOR PRODUCTION,
TOOL & DIE MEN SPECIFY
HY-TEN
"M" TEMPER ALLOY STEEL
for maximum machinability and minimum heat-treat distortion. It has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. For complete information on HY-TEN alloy steels, write for FREE DATA BOOK.
100 YEARS OF SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS.
TOOL ROOM AND MAINTENANCE REQUIREMENTS.
WHEELOCK, LOVEJOY & CO., INC. Warehouse Service
125 Sidney St., Cambridge 39, Mass.
CAMBRIDGE · CLEVELAND · CHICAGO
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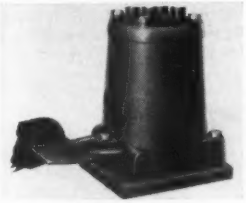
"THE ORIGINAL" MAUSER
MAUSER PRECISION VERNIER CALIPER
$14.75 PPD
MONEY BACK GUARANTEE FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS 1/1000" — 1/128" 1/10 mm. IN BACK
NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK... IS YOUR PROTECTION.
GEO. SCHERR CO. INC. 200-T LAFAYETTE ST. • N.Y. 12, N.Y.

OPTICAL MICROMETER
Toolmakers Microscope
$461.00* Prompt Delivery. .0001" accuracy. 6½" x 6½" range. Net weight 38½ lbs.
* Without lights or gage rods.
New York and Pennsylvania agent needed.
WRITE AIRMAIL
BOECKELER INSTRUMENT CO.
P.O. Box 181 TUCSON 1, ARIZONA

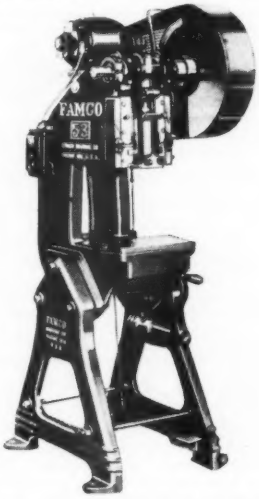
Quick-As-Wink Foot Operated Valves permit hammers, shears, presses and other types of air operated machinery and equipment to be fully controlled simply by foot pressure on a pedal. Thus, the operator has both hands



free to handle the work. All operating parts are fully enclosed against the entrance of dust and dirt. Complete details and a descriptive catalog is offered by the manufacturer, C. B. HUNT & SON, INC., 2200 E. Pershing Ave., Salem, Ohio.

Circle Inform-A-Gram No. A17.

Famco OBI Power Presses. Five deep-throated models have been added to this line. They are rated in 5 and 8 ton capacities, will take work 20" and 24" in dia., and offer four shut heights from 6" to 13" with up to

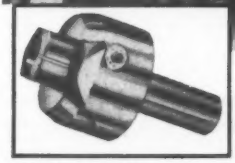


3" strokes. The balance of the Famco power press line consists of seven other models of from 3 to 7½ ton capacity. For further details, write FAMCO MACHINE CO., 1320 18th St., Racine, Wis.

Circle Inform-A-Gram No. A18.

EVEREDE 8-WAYS BETTER

OFFSET
BORING HEADS
LICK PRECISION-BORING PROBLEMS!



On turret lathes as well as jig-boring and horizontal milling machines.

DEEP OR SHALLOW PRECISION BORING with a minimum of spring or chatter. Adjustable feature eliminates need to stock various-length bars!

Modern precision-boring means EveredE Boring Heads in more and more of the nation's major plants. That's because EveredE Boring Heads provide so many proven features which increase production with less effort, time and cost.

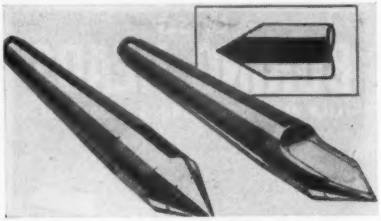
THREE SIZES . . . provided with split type bushings . . . permit using straight type boring bars . . . afford adjustment in extended bar-lengths, giving greatest rigidity . . . while cutting with famed EveredE Triangular HSS or solid carbide tool bits.

FULL DETAILS WILL SOLVE YOUR BORING PROBLEMS...SEND FOR THEM TODAY!

EVEREDE Tool Co.
2000 North Parkside Avenue
Chicago 39, Illinois

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

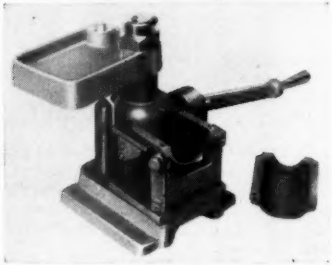
"M-40-U" Alloy Centers feature a new wear and abrasion-resistant material developed by Gorham. This "M-40-U" forms a core that is induction brazed into the steel shank of the



center, after which the entire center is finish ground. Thus, the wear material is always supported by the tough steel shank throughout the life of the center. A cleanup grind is required only when wear finally occurs, and hundreds of cleanup grinds can be made without loss of wear-resistant properties, since the "M-40-U" alloy is actually a deep core (inset), rather than a clad or applied tip. GORHAM TOOL CO., 14400 Woodrow Wilson Ave., Detroit 3, Mich.

Circle Inform-A-Gram No. A19.

A New Kind of Top-Loading Drill Fixture, the Bowlzer Auto-Swing-Jig, has the unique advantage of lifting and swinging the bushing plate aside automatically when the operating handle is moved in the proper direction. On the reverse stroke of the handle, the bushing plate swings back into place over the workpiece, and instantly locks in clamping position. While in the closed position,

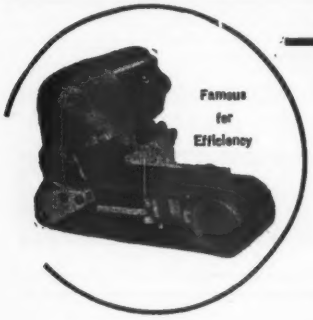


the bushing plate is maintained in alignment by two large, hardened and ground steel pins. A. H. BOWLZER MFG. CO., 10130 San Vincente Ave., South Gate, Calif.

Circle Inform-A-Gram No. A20.

EXTRA HARD! EXTRA TOUGH!
Longer Life Between Grinds!
for.. Die Sinkers
Millers
Duplicators
Pantographs
BLACK PANTHER CUTTER
Write for Literature and Prices
EDWARD D. STRAND COMPANY
Box 54, West Side Sta., Worcester, Mass.

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.



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STANDARD D-4 ABRASIVE BAND GRINDER
This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!
Other styles and sizes in New Manual on finishing — Write today
WALLS SALES CORP.
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The Sterling Drill & Carbide Grinder has been substantially improved by McDonough Mfg. Co. A simplified adjustment to compensate for grinding wheel wear improves the accuracy of setting the machine for various drill diameters. Another improvement is the permanent mounting of a diamond wheel dresser on the drill grinding wheel guard. It is always available for easy dressing of the wheel and when not in use, swings back out of the way. On the carbide tool grinding side, a graduated quadrant has been added to the table, making it simple to set the clearance angles accurately. McDONOUGH MFG. CO., Dept. T&P, Eau Claire, Wis.
Circle Inform-A-Gram No. A21.

New Wales Twin Column Punch Presses can be used for all types of blanking, forming, drawing and bending. Due to the similarity of design between these presses and a standard die set, the Wales Presses, in many cases, eliminate the necessity of die sets. Rapid action 4-point clutch with a sliding clutch dog provides smooth, rapid action for high speed production. Exclusive dual purpose clutch counterbalance is an ingenious feature that supplements the conventional friction-type

brake which is installed on the end of the shaft. Functionally colored Catalog TC, can be had from WALES-STRIPPIT CORP., 355 Payne Ave., North Tonawanda, N. Y.
Circle Inform-A-Gram No. A22.

1500° F. IN 5 MINUTES

Quick-Acting
JOHNSON
No. 120 Hi-Speed
FURNACE
$145.50
F.O.B. Factory

2300° F. IN 30 MINUTES

Turn the heat on production. Heat treat carbon and high speed steels, dies and tools in your own plant with JOHNSON No. 120 Hi-Speed. Fast heat-up saves time and gas. Temperatures easily regulated with accuracy. Firebox: 5 x 7¾ x 13½. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

Also available in bench style.
Write for Free Catalog.

Johnson Gas Appliance Co.,
575 E Avenue N.W., Cedar Rapids, Iowa

JOHNSON
FURNACES FOR INDUSTRY

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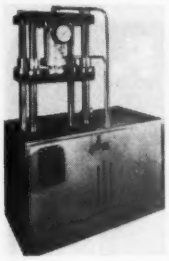
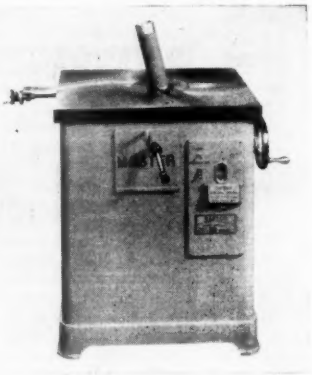


The New Oilpower Hydraulic Forming & Drawing Press has a 50-ton rating, continuous duty. Movement of the press is controlled by a fast-acting, lever type, four-way valve. The ram is down-moving, double-acting. This press is designed for drawing to a maximum depth of 5" and the largest blank the pressure pad will accommodate is 16" x 16". It can also be used for single-acting operations. OILPOWER ENGINEERING CO., 1067 Davis Terrace, Schenectady 5, N. Y. **Circle Inform-A-Gram No. A23.**

The MASTER Spindle Sander & Grinder has a tilting spindle rather than a tilting table. The job on which the operator works is always in a horizontal position. The spindle can be used oscillating or non-oscillating, can be tilted from 0° to 45° by a worm and gear unit, and can be securely locked in place at any desired position. This machine is adaptable for metal, plastics and wood. KINDT-



COLLINS CO., 12653 Elmwood Ave., Cleveland 11, Ohio, will provide details. **Circle Inform-A-Gram No. A24.**

SAVE TIME and MONEY with SUPEREAM

STOP-PINS AVAILABLE IN 5 SIZES

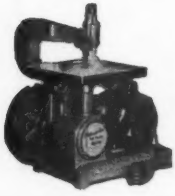
FINGER STOPS IN 3 SIZES

STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. SUPEREAM FINGER STOPS made in uniform width to fit any standard width slot. Just grind ends to fit. Write for literature.

TWENTIETH CENTURY MANUFACTURING CO.
1720 MONTROSE AVENUE CHICAGO 13, ILLINOIS

MILWAUKEE DIE FILERS PROFILE GRINDERS

Gives you more value for your money!

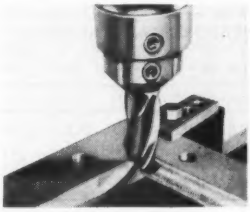


DIE FILER
Model FS shown performs all die making operations. Equipment includes File Roller Support Overarm in addition to overarm shown.

PROFILE GRINDER
Available in two models, STANDARD and HIGH SPEED. Features ½ HP Motor for non-stalling power, Collet Chuck for extreme accuracy and compound tilting table.

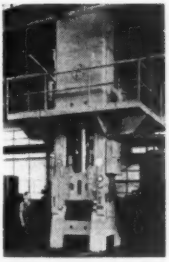
RICE PUMP & MACHINE COMPANY
228 N. MILWAUKEE ST., GRAFTON, WISCONSIN

Weldon's New Heavy Duty End Mills with 2" dia. shanks are held by a new style end mill holder that bolts securely on the spinale



nose of all milling machines having No. 50 millir a machine standard taper. True running is assured by a centering plug that fits into the spindle taper. The holder permits unusually heavy cuts to be taken. THE WELDON TOOL CO., 3000 Woodhill Rd., Cleveland 4, Ohio.

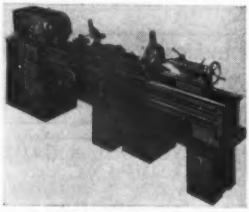
Circle Inform-A-Gram No. A25.



The First 200-Ton Hydraulic Press for producing 105 mm cartridge cases from cold drawn steel has been shipped by Lake Erie Engineering Corp. The press has a bed area of 30" x 30", daylight opening of 66" and 48" stroke. It stands 22 ft. above the floor and is powered by a 125 hp motor. Complete details on the firm's new press lines can be had from LAKE ERIE ENGINEERING CORP., Dept. T&P, Woodward Ave., Buffalo 17, N. Y.

Circle Inform-A-Gram No. A26.

Diamond-Meuser Precision High-Speed Lathe Model M-111 has 16" swing over ways, 82" center distance and 24" swing over gap. It comes complete with a full line of accessories. A catalog sheet from DIAMOND MA-



CHINE TOOL CO., 3429 E. Olympic Blvd., Los Angeles 23, Calif., gives details.

Circle Inform-A-Gram No. A27.

PRECISION IN VOLUME INSPECTION
WITH
COMPARITOL

For quick checking of duplicate work visually, to 1/10000th. Separate anvils and contact points to suit a variety of work. No electric contacts, no heating up period, no pivots, bearings, backlash, etc. THE MOST RELIABLE COMPARATOR FOR ALL MEASURING PURPOSES.

WRITE FOR ILLUSTRATED FOLDER
GEORGE SCHERR CO., Inc.
200-T LAFAYETTE ST. • NEW YORK 12, N.Y.

YOST DRILL PRESS VISE

● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
MEADVILLE • PENNSYLVANIA

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ARIZONA TOOL & DIE COMPANY
P. O. Box 181, Tucson, Arizona — Dial 3-8842. Jig boring and repetition hole spacing work using Boeckeler OPTICAL FOLLOWER. Specialists in radio chassis work.

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DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

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19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

New York

AMERICAN MEASURING INSTRUMENTS CORP.
240 West 40th St., New York 18, N. Y. Jigs fixtures, gages, dies, precision parts.

CONRAD & MOSER
2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines Aluminum Cast Parts, Aluminum Sheet Formed Housings.

THE PIPE MACHINERY COMPANY
261 Fifth Avenue, N. Y. C., MU .3-0934-5-6 Mfgs. Thread Gages-taps-dies, (large stocks, specials and standards)—established 1912.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, O., MUlberry 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures **Special Machines**
Production Engineering
Complete Plant Routing and Tooling

THE DENNING MANUFACTURING CO.
2024 E. 70th St., Cleveland, O., EX. 1-4900. Designers and Builders of High Grade Dies.

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, O., WO 1-4736 Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

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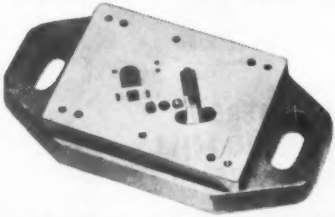

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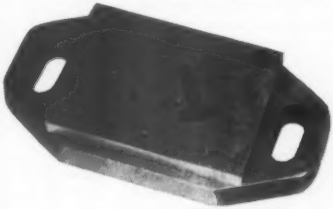

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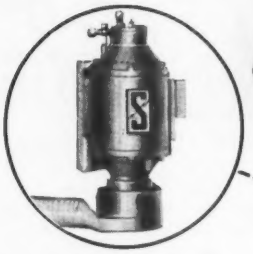

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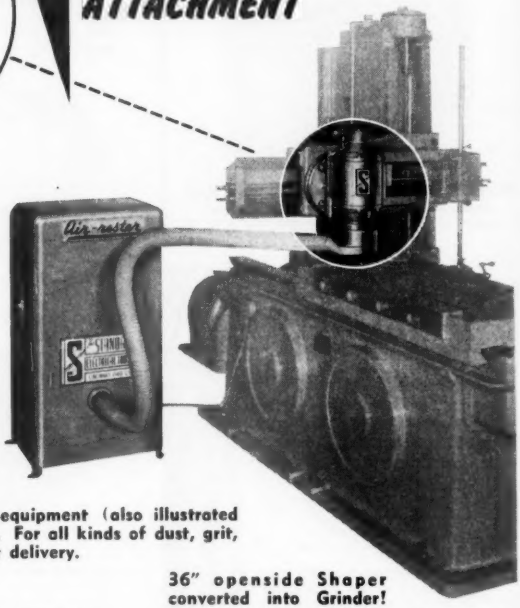

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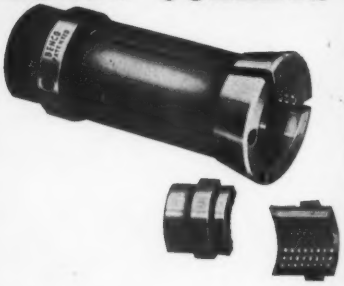

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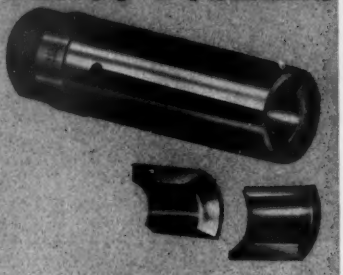

Benco Master Pushers solve difficult feeding jobs—increase production—reduce stock waste.

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